1970

Evaluation of a Pictorial Form of Instructional Aid in the Teaching of a Motor Skill.

Ballard Jewell Moore
Louisiana State University and Agricultural & Mechanical College

EVALUATION OF A PICTORIAL FORM OF INSTRUCTIONAL AID IN THE TEACHING OF A MOTOR SKILL

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Education

in

The Department of Health, Physical, and
Recreation Education

by
Ballard J. Moore
B.S., Western Kentucky University, 1958
M.A., University of Kentucky, 1959
August, 1970

DEDICATION

This study is respectfully dedicated to a former friend and inspiration, Dr. Harold Curtis Hand.

ACKNOWLEDGMENT

The author would like to express his gratitude and appreciation to Dr. Francis Drury for all his cooperation in this study and encouragement during the past two years.

To the author's major professor, Dr. Jack Nelson, special thanks must go for all his patience, guidance, and thoughtfulness throughout this work.

Recognition must also be given to William A. Noonan, Jr., Director of the AAHPER Lifetime Sports Education Project, for his assistance in making this study possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Ninety-six seventh, eighth, and eleventh grade males and eighty-two coeducational college students were subjects used to determine the value of cartoon illustration in imparting knowledge of tennis fundamentals. Each grade was composed of two sections, while the college students were enrolled in four classes. Five classes were taught fundamentals for twelve sessions using cartoon illustrations; and five taught identical fundamentals traditionally. One week after instruction a knowledge test was administered. A two by three factorial analysis of variance, and an analysis of variance with a hierarchical classification were employed respectively with the grade levels and college groups.

Twenty-six teachers and 671 students at secondary and college levels used a cartoon booklet during beginning classes, then evaluated its effectiveness by questionnaires. A two by two by three factorial analysis of variance was employed with thirty teacher evaluations; and a two by two factorial analysis of variance was computed for eleven student evaluations. Those parts of the questionnaires not evaluated by statistical methods were analyzed and interpreted in terms of per cent of total responses.

Findings

1. There was no difference in scores on a knowledge

test of tennis fundamentals of students taught with and without cartoon illustrations used as a teaching aid.

2. It was found that the knowledge test scores of the eleventh grade students was significantly higher than the scores of the seventh and eighth graders, and that college males scored higher on the knowledge test than college females, regardless of whether or not cartoon illustrations were used as a teaching aid.
3. It was found that male teachers, teachers with more experience, and teachers at the secondary level utilized the booklet more in their class preparations than did female teachers, teachers with less experience, and college teachers. College teachers utilized the booklet as a supplement in their preparation for classes significantly more than did the secondary teachers.
4. Teachers with six to twelve years of experience reported that they found that cartoon illustrations created additional rapport with the students and promoted faster learning more so than did the teachers with little experience and teachers with considerable experience.
5. Ninety-three per cent of the teachers rated

cartoon illustrations as good or excellent as a teaching aid.

6. The chapter on Basic Essentials was rated most valuable by both the teachers and students.
7. Overall, female students used the cartoon illustrated booklet more and felt that it stimulated discussion more than the males, and secondary students utilized the booklet and felt it stimulated discussion more than the college students.
8. The female students believed the cartoon illustrations clarified instruction and that they were better able to recall information to a greater degree than the male students. However, a significant interaction was found in that the secondary boys believed this to be true more so than the secondary girls.

Conclusions

1. Cartoon illustrations of the basic fundamentals of a motor skill used to supplement regular instruction apparently do not result in the acquisition of a greater degree of knowledge, as measured by a written objective test, than that which is brought about through explanation and demonstration by the teacher alone.
2. Cartoon illustrations are a valuable aid in class preparation, in teaching, and in

supplementing instruction in a motor skill.

3. The use of cartoon illustrations as a teaching aid is generally well received by students at both the secondary and college levels.
4. Females tend to be more receptive to cartoon illustrations as a supplement in learning a motor skill than do males, and secondary students more so than college students.

CHAPTER I

INTRODUCTION

Physical education personnel have continually attempted to avail themselves of various forms of educational media in order to help the learner understand and grasp knowledge or skill in an easier, more comprehensive fashion. New trends and instructional methods unknown only a few years ago have been introduced, evaluated, and even institutionalized in a relatively short period of time.[1]

Visual instruction has always had an important place in the teaching of physical education activities.[2] Visual aids, which include slides, film strips, loop films and motion pictures have been in use for some time. In more recent years, closed circuit television has been a steadily growing medium, while an even newer visual technique has been the use of instant television replay.[3]

---

[1]Kenneth A. Penman, Douglas Bartz, and Rex Davis, "Relative Effectiveness of an Instant Replay Videotape Recorder in Teaching Trampoline," Research Quarterly, XXXIX (December, 1968), 1060-1062.

[2]Florence L. Hupprich, "The Use of Visual Aids in Teaching Tennis," Journal of Health, Physical Education, and Recreation, XII (February, 1941), 93.

[3]John E. Caine, "The Effect of Instant Analysis and Reinforcement of Motor Performance Through the Use of Cinematography Techniques Related to Television" (unpublished Doctoral dissertation, Colorado State College, 1966). (Microfilm.)

According to Drury,[4] some types of visual aids have probably always been used by educators in their teaching procedures. The extensive use of visual aids by the Armed Forces during and following World War II has helped to stimulate a greater use of visual aids in the schools. Irwin[5] found through army research information that eighty-five per cent of all learning reaches men through the sense of sight.

While teacher demonstration has been the most widely used visual aid in the physical education profession, it would be wrong to consider it sufficient for all teaching problems in the field. Skubic[6] pointed out that while teacher demonstration is highly important, visual aids can be used profitably, and often they are indispensable in that they are more effective, accurate, and efficient than teacher demonstration. It appears that the use of visual aids in physical education is almost limitless, and will

---

[4]Frances A. Drury, "An Evaluation of Visual Aids in the Teaching of Tumbling" (unpublished Doctoral dissertation, State University of Iowa, 1959). (Microfilm.)

[5]June Irwin, "The Effect of Selected Audio-Visual Aids on Teaching Beginning Tennis Skill and Knowledge to College Women" (unpublished Doctoral dissertation, Indiana University, 1958). (Microfilm.)

[6]Elvera Skubic, "Teaching Archery with Audio-Visual Aids," Journal of Health, Physical Education, and Recreation, XX (April, 1949), 284.

continue to have great potential. Physical educators must seek, develop, and utilize new forms of visual aids which will aid students in the acquisition of strategy, skills and techniques. Otherwise, as Hixson[7] brought out, physical educators seeking to preserve the status quo and the "good old ways" are burying their heads in the sands of complacency or incomprehension.

A relatively new form of visual aid in the field of physical education is the use of cartoon illustration. Research on its effectiveness in the teaching of skills and retention of knowledge, however, has been limited and somewhat inconclusive.

I. STATEMENT OF THE PROBLEM

This study attempted to gain knowledge concerning the use of a pictorial aid in the teaching and learning of a motor skill with regard to the following questions: Are there knowledge differences between learners of divergent educational levels taught fundamentals of a motor skill with and without cartoon illustration? How do teachers and students of different educational levels and sexes evaluate the

---

[7] Chalmer G. Hixson, "The Status and Potential of Instructional Television for Physical Education," Journal of Health, Physical Education, and Recreation, XXXIII (May-June, 1962), 25.

effectiveness of cartoon illustration in the teaching and learning of a motor skill?

II. PURPOSE OF THE STUDY

The purpose of this study was twofold: (1) It was the purpose of this study to determine the comparative effectiveness of teaching a motor skill with and without the use of a cartoon illustrated booklet as a teaching aid, as indicated by performance on a knowledge test; and (2) It was the purpose of this study to evaluate the receptiveness and educational worth of cartoon illustration as an aid in the teaching and learning of a motor skill, from the standpoint of both teachers and students.

III. SIGNIFICANCE OF THE STUDY

The emergence, acceptance, and widespread use of visual aids following the wartime experiences of industry and armed services has proved to be of tremendous benefit to education. Numerous types of visual aids have been utilized to supplement the teaching-learning situation and have been found to be effective and worth their cost in time and money.

Cartoon illustration has been used sparingly in the teaching of physical education activities. Yet texts and leading journals in health and physical education have used cartoons more and more to portray in a quick, easy manner what they were presenting to the reader. In these days when more widespread use of teaching aids and the actuality of self-instruction loom as possibilities beyond the horizon,

investigation into the worthiness of cartoon illustration as one of the newer visual aids is indispensable.

Schramm[8] stated that absence of research on the relative strengths of educational media handicaps the development and implementation of effective educational media in the teaching-learning process. Hoban[9] declared that the evaluation of educational media is important, and knowing how media effectively contribute to desired educational outcomes is one of the first steps in improving its efficiency.

If a visual aid such as cartoon illustration can be scrutinized and honed to a fineness whereby the stage becomes set for more enjoyment and learning of a sport, then this possibility deserves investigation.

IV. DELIMITATIONS OF THE STUDY

The cartoon illustrations used in this study were delimited to the fundamental skills of tennis, which included basic essentials, forehand, backhand, and service. All were contained together in one forty-four page book.

---

[8]William Schramm, "The Publishing Process," Text Materials in Modern Education, ed. Lee J. Cronbach (Urbana, Ill.: University of Illinois Press, 1955), p. 127.

[9]Charles F. Hoban, Jr., Focus on Learning (Washington, D.C.: American Council on Education, 1942), p. 127.

The part of this study dealing with knowledge of tennis fundamentals attained through the use of cartoon illustration was delimited: (1) to male students (N = 96) enrolled in six beginning tennis classes at the seventh, eighth, and eleventh grade levels; and (2) to four coeducational beginning tennis classes (N = 82) at the college level.

The part of this study dealing with evaluation of cartoon illustration in the teaching and learning of tennis fundamentals was delimited to teachers (N = 26) and students (N = 691) of beginning tennis classes at both the secondary and college levels in Louisiana.

V. LIMITATIONS OF THE STUDY

The evaluation concerning the use of The Beginner's Self Instruction Book of Tennis Fundamentals[10] was limited specifically to the results obtained from the knowledge test and questionnaires used in the study.

Differences in the ability of the instructors to teach and supplement instruction with the cartoon booklet may have been a factor in evaluating its worth by both teachers and students. Differences in motivation of the teachers also may have influenced the amount of use and effectiveness

---

[10]Ivan L. Harless, "The Development of a Self Instruction Book of Beginning Tennis Skills" (unpublished Master's thesis, Louisiana State University, 1968).

of the utilization of the cartoon booklet.

While all the subjects completed the procedure of this study in and around tennis courts, differences could have existed in facilities and duration of the various tennis classes which may have exerted some influence.

VI. DEFINITION OF TERMS

Cartoon illustration. As used in this study, this term referred to cartoons which provide quick, simple, pictorial images of beginning tennis fundamentals.

Cartoon book. The use of this term in this study was in reference to the cartoon booklet, The Beginner's Self Instruction Book of Tennis Fundamentals.

Knowledge test. Reference was made to a written test developed for this study which assessed the knowledge of tennis fundamentals of students taught with and without the aid of cartoon illustration.

Visual aid. This term referred to any teaching device using vision as the chief medium to aid instruction.

Traditional manner. This referred to instruction given students whereby they depend solely upon verbal instruction, demonstration, practice, and verbal correction.

CHAPTER II

REVIEW OF LITERATURE

The review of literature presented in this chapter was given under five main headings. These headings were as follows: (1) Studies Related to Motion Pictures as Visual Aids; (2) Studies Related to Loop Films as Visual Aids; (3) Studies Related to Video-Tape as Visual Aids; (4) Studies Related to Cartoon Illustration as Visual Aids; and (5) Cartoon Illustrated Teaching Aids.

I. STUDIES RELATED TO MOTION PICTURES AS VISUAL AIDS

Ruffa[11] prepared a film to aid in the teaching of the football throw, broad jump, shot put, high jump, and 100 yard dash. The film employed was constructed particularly for use in this experiment, and was found conclusively to be of positive value in the teaching of these skills, particularly track events.

Bartruff[12] investigated the value of slow-motion pictures as an aid in teaching elementary tumbling to

---

[11]Edward Ruffa, "How Motion Pictures Help the Coach," Athletic Journal, XXVII (May, 1937), 20.

[12]Harry L. Bartruff, "The Use of Slow Motion Pictures in Teaching Tumbling" (unpublished Master's thesis, University of Southern California, 1938).

forty-six seventh grade boys. Since eighteen of the twenty-three subjects who were instructed with the aid of motion pictures had greater gains than their paired subjects who were instructed without the aid of motion pictures, the investigator concluded that slow-motion pictures were of value in the teaching of tumbling.

Adams[13] studied the use of school-made films in teaching the service to beginning tennis players. Films of a tennis expert were shown eight beginners before any instruction. In the initial stages of learning, films were made and shown to the group so they could make comparisons of their serves to those of the expert. At the end of all instruction, the beginners were rephotographed, and the investigator concluded that instruction time could be cut approximately fifty per cent by using good motion pictures and still not sacrifice the learning results.

Priebe and Burton[14] investigated the use of motion pictures in the teaching of high school boys in the western-roll style of high jumping. The control group received detailed instruction, demonstration, criticism and assistance.

---

[13]Thurston Adams, "Motion Pictures in Physical Education, Teaching the Tennis Serve with School Made Films" (unpublished Doctoral dissertation, Teachers College, Columbia University, 1939).

[14]Roy E. Priebe and William H. Burton, "The Slow Motion Picture as a Coaching Device," School Review, LXVII (March, 1939), 152-158.

The experimental group observed motion pictures of champion jumpers and also motion pictures made of themselves. The investigators concluded that motion pictures facilitated learning and eliminated, to a large extent, the initial trial and error period.

Lockhart[15] conducted a study specifically concerned with determining the value of the motion picture as an instructional device in learning bowling. The experimental group used a film in its entirety many times, and also specific parts of the film were used for class and individual instruction each day. The control group was taught in the traditional manner. Results compiled over two winter seasons indicated that the rate of improvement in learning of the movie group was more consistent than that of the control group.

Olney[16] conducted a study on the effect of the motion picture in teaching the jackknife dive. Only nine subjects participated in the study, with five in the experimental group and four in the control group. Each group had twenty-seven lessons of thirty-five minutes each, except

---

[15]Aileen Lockhart, "The Value of the Motion Pictures as an Instructional Device in Learning a Motor Skill," Research Quarterly, XV (May, 1944), 181-187.

[16]June Olney, "The Effect of the Use of Motion Pictures as an Aid in Learning the Jackknife Dive" (unpublished Master's thesis, MacMurray College, 1944).

that one day a week the experimental group met one-half hour earlier than the control group to study motion pictures of an expert. It was concluded that the motion pictures were a decided advantage in teaching the correct form and execution in the early stages of the dive.

Yarbrough[17] made a study of the effectiveness with which motion pictures may be used in teaching undergraduate college women skills in beginning field hockey. After twelve weeks of instruction, the mean differences of individual scores in favor of the experimental group indicated that the motion picture improved the learning of field hockey skills.

In a study which measured the relative progress of tumbling classes taught with and without the use of motion pictures, Brown and Messersmith[18] showed pictures of experienced tumblers executing selected stunts in correct form to an experimental group. Later the same group viewed pictures made of themselves performing the same activities.

---

[17]Edna Yarbrough, "A Study of the Effectiveness with Which the Motion Picture may be Used in Teaching Undergraduate College Women Skills of Beginning Field Hockey" (unpublished Master's thesis, Texas State College for Women, 1947).

[18]Howard Steven Brown and Lloyd Messersmith, "An Experiment in Teaching Tumbling With and Without Motion Pictures," Research Quarterly, XXIX (December, 1948), 304-307.

The control group used as a review the time allowed the experimental group for viewing the motion pictures. Although there was a tendency for the experimental group to be highly motivated when moving pictures were made of them, there were no significant differences between the two groups in tumbling ability.

In a study involving the teaching of elementary diving, Kern[19] compared learning with and without use of visual aids. Motion pictures at slow and normal speed, and tracings made from motion pictures were included in the teaching procedure in the experimental group but were omitted with the control group. No significant difference was obtained between the rates of learning.

Jones[20] studied the effect of motion pictures in teaching the long and short serves in badminton. An experimental group received oral explanation and demonstrated methods, but motion pictures were made of each subject, then conferences held with each. The control group received only the instruction that could be given with oral explanation and demonstration. Skill tests given to both groups yielded

---

[19]Rebecca W. Kern, "The Value of Visual Aid in Teaching Elementary Diving to College Women" (unpublished Master's thesis, State University of Iowa, 1951).

[20]Margaret Lois Jones, "The Use of an Experimental Study in Motion Pictures of Individuals as an Instructional Device in Teaching Badminton Techniques" (unpublished Master's thesis, Smith College, 1951).

no significant difference in long and short serving ability.

Fowler[21] undertook a study to determine the value of slow-motion pictures in teaching tennis skills. Although the experimental group displayed a higher mean gain, it was not sufficient to be deemed significant over the control group. The investigator did state, however, that the students viewing slow-motion pictures of tennis skills were generally more interested and motivated than the students in the control group.

Drury[22] evaluated the effectiveness of various visual aids in the teaching of beginning tumbling with regard to the type of visual aid, the number of times used, and the difficulty of the stunts that were taught. The visual aids used were a slow-motion camera, a demonstrator, and drawings. No one of the three visual aids was more effective in the teaching of tumbling than the other.

Hainfield[23] reported a study in which locally produced films were used with one of three groups of non-swimmers who were taught skills necessary to jump into a

---

[21] Joyce Fowler, "The Value of the Slow Motion Picture as an Instructional Aid in the Teaching of Tennis Skills" (unpublished Master's thesis, University of North Carolina, 1955).

[22] Drury, op. cit., pp. 1-2.

[23] Harold Hainfield, "Slow Motion Movies for Swimming Coaches," Scholastic Coach, IX (January, 1960), 48.

pool, level off, and swim twenty-five yards. Thirteen of eighteen in the group who saw themselves attempting the skills were able to perform those skills after one week of instruction, while only seven of twenty in one control group and six of seventeen in the other control group accomplished the same skills.

Motion pictures were utilized in three different ways by Wyness[24] to compare performance of subjects in putting the shot. One group viewed motion pictures of themselves putting the shot. A second group viewed motion pictures of champions putting the shot, while the third group saw motion pictures of both themselves and champions. No significant differences were found in the abilities of the three groups to put the shot as a results of the three methods.

In a study with collegiate varsity players Watkins[25] found that baseball players who received batting instruction and viewed motion pictures of their batting significantly decreased the number of batting faults they committed, as compared to baseball players who received the same instruction but did not view motion pictures of their batting.

---

[24]Gerald B. Wyness, "A Study of the Effectiveness of Motion Pictures as an Aid in Teaching a Gross Motor Skill" (unpublished Doctoral dissertation, University of Oregon, 1963). (Microfilm.)

[25]David L. Watkins, "Motion Pictures as an Aid in Correcting Baseball Batting Faults," Research Quarterly, XXXIV (May, 1963), 228-233.

Hawthorne[26] examined the effectiveness of the eight millimeter slow-motion picture as a device for helping beginning golfers make improvement in their golf form. An experimental group was shown slow-motion pictures of their performance while the control group participated regularly. The mean gains of the experimental group were significantly higher than those of the control group.

In summary, the studies reviewed concerning motion pictures as visual aids generally attested to the effectiveness of this medium. Of the sixteen studies, ten showed motion pictures to be of significant value, while six found no significant effect. Eleven activities were utilized in the sixteen studies. Tumbling, swimming and diving, tennis, and track events were studied most often, while golf, baseball, badminton, field hockey, bowling, and football were studied only once each.

II. STUDIES RELATED TO LOOP FILMS AS VISUAL AIDS

Murnin, Hayes, and Harby[27] reported a study involving college

---

[26]Martha Ellen Hawthorne, "A Study of the Effectiveness of the Slow Motion Picture in Teaching Golf" (unpublished Master's thesis, Louisiana State University, 1964).

[27]J. A. Murnin, W. Hayes, and S. F. Harby, "Daylight in Projection of Film Loops as the Teaching Medium in Perceptual-Motor Skill Training" (SDC 269-7-26, Instructional Film Research Program, Pennsylvania State College, 1952).

males learning tumbling with and without film loops. The film-taught classes were instructed by an inexperienced teacher who could not perform the tumbling skills, while the second group was taught by an experienced instructor who used all of the conventional teaching methods except films. The classes taught by the experienced instructor scored significantly better on the final performance test than the film-taught classes instructed by the inexperienced teacher. Harby,[28] in the same year taught tumbling to college males both with and without film loops, and found no significant difference in the amount of learning exhibited between the two groups.

Karsner[29] reported a study in which he taught badminton to three different groups of college males. In one group the loops were used following each demonstration and lecture by the instructor. In another group they were used after all the strokes had been demonstrated and explained by the instructor. An experimental group used the loops without a demonstration by an instructor. No significant differences were found.

---

[28]S. F. Harby, "Evaluation of a Procedure for Using Daylight Projection of Film Loops in Teaching Skills" (SDC 269-7-25, Instructional Film Research Program, Pennsylvania State College, 1952).

[29]Milo G. Karsner, "An Evaluation of Motion Picture Loops in Group Instruction in Badminton" (unpublished Doctoral dissertation, State University of Iowa, 1953). (Microfilm.)

Friedrichsen[30] compared the effectiveness of loop films that showed errors to loop films depicting correct performances of gymnastic stunts. One group viewed loops which showed only errors in performance, while the second group observed loops of correct performance of the stunts. The investigation yielded significance and concluded that the errored loop films were more effective.

Nelson[31] studied the effect of slow-motion loop films with beginning golf students. The experimental group learned golf with the aid of explanation, demonstration, and slow-motion loop films; whereas the control group learned the skill with the aid of explanation and demonstration. Findings indicated no significant difference between groups.

A study was made by Gray and Brumbach[32] to ascertain the value of new loop film projection equipment as a supplemental aid in teaching badminton. An experimental group had their instruction supplemented by viewing homemade loop films of basic badminton strokes and loops showing singles

---

[30]Friedrich W. Friedrichsen, "A Study of the Effectiveness of Loop Films as Instructional Aids in Teaching Gymnastic Stunts" (unpublished Master's thesis, State University of Iowa, 1956).

[31]Dale O. Nelson, "Effect of Slow Motion Loopfilms on the Learning of Golf," Research Quarterly, XXIX (March, 1958), 37-45.

[32]Charles A. Gray and Wayne B. Brumbach, "Effect of Daylight Projection of Film Loops on Learning Badminton," Research Quarterly, XXXVIII (December, 1967), 562-569.

and doubles play. The loops were projected by new equipment produced by the Technicolor Corporation. The control group was taught badminton without loops of any sort. At the end of ten weeks, no significant difference existed between the groups.

In summary, one study demonstrated the value of loop films as visual aids, and five found no significant effect over that of regular instruction. Gymnastics was the only activity which indicated superior value, while golf and two studies involving badminton and two studies involving tumbling found none. Therefore, this portion of the review of literature indicated little value in the use of loop films as visual aids.

III. STUDIES RELATED TO VIDEO-TAPE AS VISUAL AIDS

Caine[33] conducted a study with sixty coeducational beginning bowlers in which the control group received basic verbal instruction and demonstrations, while the experimental group received the same experience, but in addition, one day a week they practiced their bowling skills in front of a television camera and had their performance immediately replayed by video-tape. There was no significant difference in bowling scores between those taught with the aid of

---

[33]Caine, op. cit., p. 1.

video-tape reply and those taught using the regular instructional process.

Using 200 eighth and ninth graders, Plese[34] compared the effectiveness of teaching selected gymnastic skills by a conventional method which utilized only verbal explanation, demonstration, practice, instructor analysis, and correction with that of the same method aided by television video-tape instant replay. Differences between the groups were significant, with twenty-one per cent more of the experimental group completing the basic gymnastic routine by the end of seven weeks.

In a study in which sixty college males used two swimming turns and the butterfly stroke, Rhea[35] provided video self-analysis for reinforcement during one of the class periods normally used for actually practicing these gross motor skills. No difference was found between the experimental and control groups in any of the three skills.

Penman, Bartz, and Davis[36] taught two groups of college freshman in a twelve-week unit in beginning

---

[34]Elliott Ray Plese, "A Comparison of Videotape Replay with a Traditional Approach in the Teaching of Selected Gymnastic Skills" (unpublished Doctoral dissertation, Ohio State University, 1967). (Microfilm.)

[35]Harold Conrad Rhea, "The Value of Video Self-Analysis as a Reinforcement Technique for Learning when Substituted for Actual Practice of Gross Motor Skills" (unpublished Doctoral dissertation, Colorado State College, 1968). (Microfilm.)

[36]Penman, Bartz, and Davis, op. cit., p. 1060.

trampoline. The experimental group used the video-tape recorder, while the control group did not. The group means for the two groups were not significantly different.

Harless,[37] using beginning activities classes at the college level, compared improvement in selected golf, tennis and badminton skills when conventional methods of instruction were used, to improvement made when video-tape recordings were used in conjunction with conventional instruction. No significant differences existed as judged by master teachers after post-analysis video observance of the subjects.

Four of the five video-tape studies reviewed showed no significant superiority in performance due to its use. Bowling, swimming, rebound tumbling, and a study involving tennis, badminton, and golf together demonstrated no appreciable value over conventional teaching methods. A study involving gymnastic skills was the only one which proved to be beneficial.

IV. STUDIES RELATED TO CARTOON ILLUSTRATION AS VISUAL AIDS

Bonnette[38] developed a cartoon booklet to teach diabetics and leprosy patients the care and prevention of

---

[37]Ivan L. Harless, "A Comparison of Improvement of Selected Motor Skills Utilizing Two Instructional Methods" (unpublished Doctoral dissertation, Louisiana State University, 1969).

[38]Allen R. Bonnette, "The Development of Educational Media for Hansen's Disease Patients Concerning Protective Care of the Feet" (unpublished Doctoral dissertation, Louisiana State University, 1958).

injuries to insensitive feet. The efforts to develop this booklet were coordinated with the medical and rehabilitation staff at the United States Public Health Service Hospital at Carville, Louisiana. The booklet, fifty-four pages in length, presented seven single concept lessons. Each lesson had a brief text, presented in English and Spanish, which was reinforced by the use of cartoon drawings.

Klesius[39] conducted a study with 135 adult diabetics of different educational levels to determine the effectiveness of cartoon illustration presented through different educational media. Using the cartoon booklet Bonnette developed, as well as a motion picture and filmstrip with the same content coverage, all three media were found to be equally effective in disseminating knowledge for the care and prevention of injuries to insensitive feet. The educational media were found to be more effective the higher the educational level of the learner.

Harless[40] developed a booklet depicting beginning tennis fundamentals in cartoon fashion. Forty-four pages in length, the booklet contains four chapters on basic

---

[39]Stephen E. Klesius, "The Effectiveness of Selected Educational Media in Disseminating Knowledge of the Care and Prevention of Injuries to Insensitive Feet to Diabetics of Different Educational Levels" (unpublished Doctoral dissertation, Louisiana State University, 1968).

[40]Harless, op. cit., p. 4.

essentials, forehand stroke, backhand stroke, and service.

Moore[41] tested the retention of cartoon illustrated tennis rules, and compared the effectiveness of a presentation of this type with the presentation of the same rules in official, written form. The retention of fifty-five junior college subjects used in the study was significantly higher in recalling twenty tennis rules that were presented by cartoon illustrations than by the official, written form.

Of the two studies done in health education, one determined the other to be effective in disseminating knowledge through cartoon illustrated media. Two studies used tennis as a medium. One developed a cartoon illustrated book of beginning tennis fundamentals, while the other proved superiority in the retention of cartoon illustrated tennis rules. It would appear that such limited research indicates a need for further study in this area.

V. CARTOON ILLUSTRATED TEACHING AIDS

A review of the literature revealed that only in the past two decades has cartoon illustration been used to aid the student in the understanding and clarification of rules, instruction, and strategy in various activities.

---

41 Ballard J. Moore, "The Retention of Cartoon Illustrated Tennis Rules" (unpublished Master's thesis, Louisiana State University, 1969).

The Athletic Institute[42,43] used cartooning originally in its Beginning Sports Slide-Film series with badminton and tennis. Of the five units contained in each of these instructor's guides, the first four included photographed frames on fundamentals. The fifth unit, however, contained numerous rules and courtesies of play presented through cartoon illustration. It should be mentioned here that these framed slides were not designed to be self-sufficient. Rather, they were most effective when considered only as basic lessons requiring further explanation and interpretation by an instructor. Although the Athletic Institute has published many guides to be used with recorded narration in the showing of filmstrips, only the badminton and tennis series employed cartoon illustration.

To emphasize the return of the cannonball, slice, and American twist services, Lumiere[44] resorted to cartooning to show and explain the same. Primarily, he emphasized certain thinking and mechanics that players at various levels should utilize in developing a return of serve,

---

[42]Kenneth Davidson and Lenore C. Smith (consultants), Badminton Instructor's Guide (Chicago: The Athletic Institute, 1952), pp. 58-68.

[43]Harry "Cap" Leighton (consultant), Tennis Instructor's Guide (Chicago: The Athletic Institute, 1958), pp. 46-57.

[44]Cornell Lumiere, "The Return of Serve," World Tennis, XII (February, 1965), 30-32.

particularly in returning the cannonball and American twist services. The main theme in all his cartoons conveys in a simple fashion the fact that the tennis player with a poor return of service has a great handicap.

Lumiere[45] used cartoons a second time to show how partners in doubles play should select one another. His cartooning in this article depicted how partners not suited to one another have problems playing as a team. Also shown in cartoon form are doubles partners who play well together. The article itself formally explains the importance of selecting doubles partners, based on the level of skill and versatility of each.

Gould[46] cartoon illustrated numerous aspects of the game of tennis, geared primarily to aid the beginning player. Many areas were covered, from the history and background of the game down to modern day application of tennis strokes. Each area was discussed and illustrated with simple cartooning to get certain points across to the reader.

Using the rules of golf, Daggett and Slocum[47] adapted fifty-six cartoon illustrations in a small, pocket

---

[45]Cornell Lumiere, "The Doubles Game," World Tennis, XII (April, 1965), 34.

[46]Dick Gould, Tennis Anyone (California: The National Press, 1966), pp. 17-23.

[47]Betty Daggett and Helen Slocum, The Easy Way to Learn Golf Rules (Chicago: National Golf Foundation, 1966), pp. 4-61.

booklet designed to be carried and referred to by students. This apparently was one of the first attempts to provide basic, simplified rules in cartoon fashion for the beginning player in an individual sport.

In his monthly series of articles on strategy and skill development, Van Der Meer[48,49] has recently begun to use cartoons to emphasize meaning and information he wishes to convey. In his original cartooning effort, the right and wrong ways to volley balls coming directly or close to the body of the tennis player were illustrated. The skill of the volley in question, as well as the positioning of the body and racket head is cartooned in a simple, vivid manner. The most recent article concerned strategy in doubles play whereby one partner backs up his teammate in volleying near the net. Four cartoons show the progression of a point, including service, positioning of partners at the net, and the backing up play of one partner for the other.

Of the eight references reviewed, three used cartoon illustration in presenting basic rules, courtesy, or fundamentals in badminton and tennis. One booklet cartooned only the rules of golf. Three publications were done by athletic

---

[48]Dennis Van Der Meer, "How to Volley Balls Coming Close to Your Body," World Tennis, XVI (December, 1968), 54.

[49]Dennis Van Der Meer, "Backing Up Your Partner," World Tennis, XVI (January, 1969), 31.

or national sports organizations, while only one was the work of an independent author. Two of the books were done by the same sports organization, and involved the showing of cartooned frames aided by recorded narration. The world's foremost tennis journal seems to be leaning more and more toward the use of cartooning. Of the four references cited as coming from this publication, two involved strategies and tactics of doubles play. The other two pertained chiefly to positioning of the body in volleying and returning various types of services.

CHAPTER III

PROCEDURE

I. OVERVIEW OF THE STUDY

This study was designed to determine the comparative effectiveness of teaching a motor skill with and without the use of a cartoon illustrated booklet as a teaching aid, as indicated by performance on a knowledge test. It also sought to evaluate the receptiveness and educational worth of cartoon illustration as an aid in the teaching and learning of a motor skill, from the standpoint of both teachers and students.

One-hundred seventy-eight beginning students at various educational levels were taught identical tennis fundamentals for twelve, thirty minute sessions either with or without the aid of a cartoon booklet. One week following the twelfth session a multiple response test assessed the subjects' knowledge of beginning tennis fundamentals. Two statistical designs were employed and inferences drawn concerning differences in methods of instruction, educational levels, and sex. Interaction between methods of instruction and certain educational levels was also analyzed.

Twenty-six instructors and 671 beginning students in eight secondary schools and seven colleges evaluated a cartoon booklet after teaching and learning tennis fundamentals with this aid. Following these twenty-six regular

courses of instruction, both teacher and student questionnaires which evaluated the effectiveness of the cartoon booklet were completed. Conclusions were then drawn from the teachers' evaluations with sex, level of instruction, and years teaching experience serving as criteria. Interactions of these factors were also analyzed. Conclusions were drawn from the results of the students' evaluations based on sex and educational level, and interaction of these factors analyzed.

II. DEVELOPMENT OF THE BOOK

In 1968, a cartoon book was developed for students of tennis at the beginning level. This book was entitled The Beginner's Self Instruction Book of Tennis Fundamentals.[50] Printing of the book for this study was sponsored by the AAHPER Lifetime Sports Education Project. Under the direction of William A. Noonan, Jr.,[51] this project has attempted to identify innovative approaches in the teaching of lifetime sports, including tennis, since its inception in 1965. In another effort to identify needed teaching aids, the Lifetime Sports Education Project was willing to

---

[50]Harless, op. cit., p. 3.

[51]Interview with William A. Noonan, Jr., Director of AAHPER Lifetime Sports Education Project, September 4, 1969.

cooperate in this study.

The book, forty-four pages in length, contains four chapters depicting tennis fundamentals in cartoon fashion. The skills are broken down into backswing, forward swing and follow-through, with special emphasis placed on the relationship of the ball, the body, and the racket at the time of contact.

The basic essentials for playing tennis are illustrated in Chapter I. One of the concepts presented in this chapter is the mechanics of the simple pivot. Figure 1, page 30, shows how the mechanics of the simple pivot are presented. The point emphasized is that the heel of one foot and the ball of the other foot must support the body weight in order to execute the pivot. The foot which has the heel on the ground will determine the direction of the pivot.[52]

Chapter II presents the skills involved in the forehand stroke. For example, in Figure 2, page 31, it is demonstrated that most of the body weight should be on the back foot at the completion of the backswing phase of the forehand stroke.[53]

The third chapter of the book is concerned with the skills involved in the backhand stroke. An example of one of the concepts involved is shown in Figure 3, page 32,

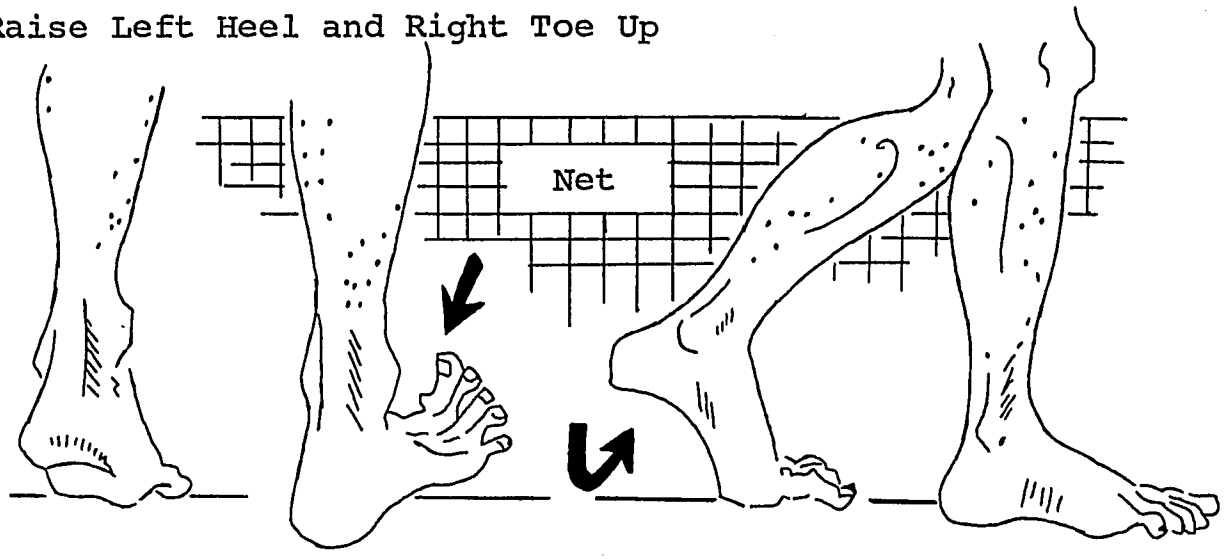
---

[52]Harless, op. cit., p. 5.

[53]Ibid., p. 15.

Start with Body Weight Equal on Feet

Raise Left Heel and Right Toe Up



Turn That-a-Way

End with Body Weight More on Right Foot

Footprints:

The Simple Pivot to the Right

Figure 1

Method Used to Present the Mechanics of the Simple Pivot to the Right

At the End of the Backswing

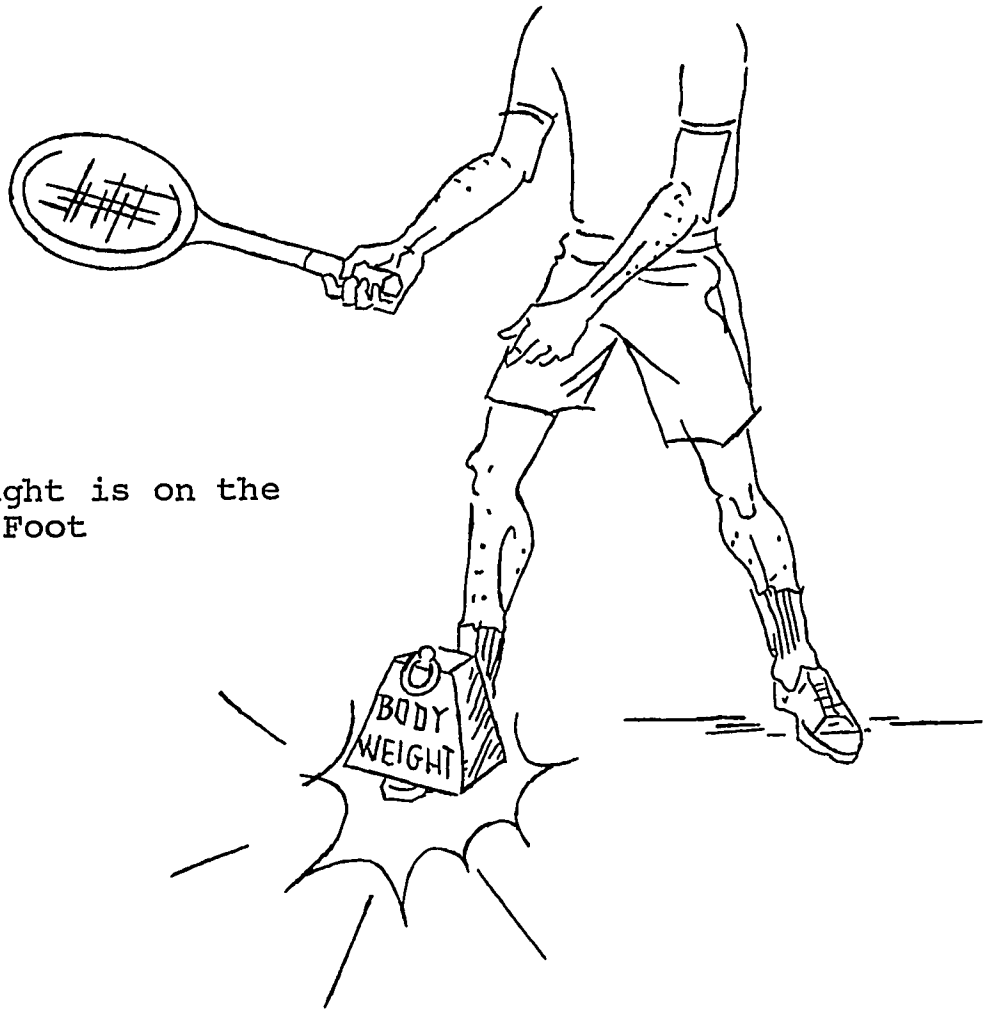


Figure 2

Method of Presenting Concept that the Body Weight is on the Right Foot at Completion of Backswing

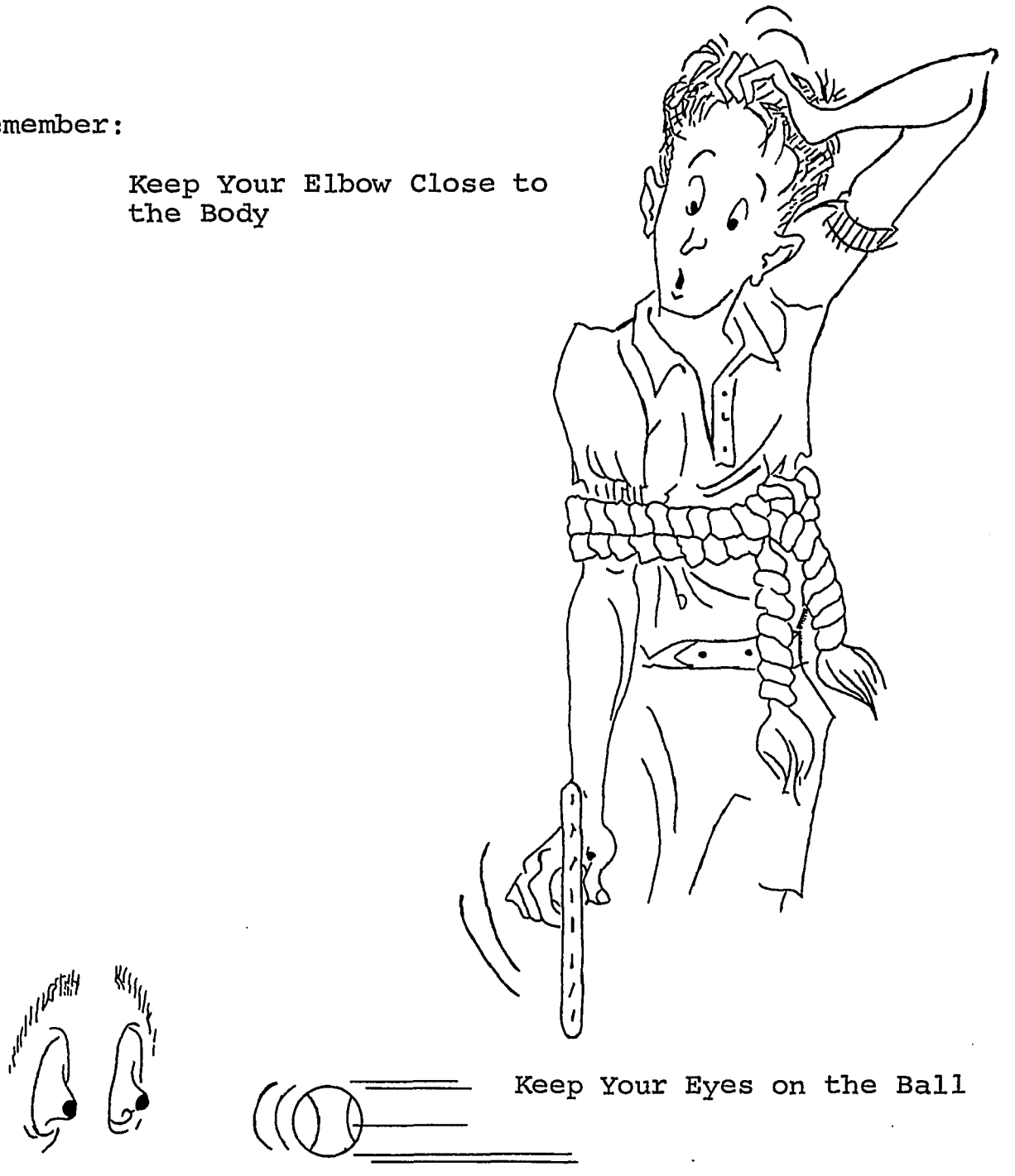


Figure 3

Method Used to Present a Summary of Two Important Concepts of the Backhand Stroke

which illustrates that the elbow should be close to the body and the eyes kept on the tennis ball in executing this skill.[54]

Figure 4, page 34, illustrates one of the skills which was presented in the chapter on the service. The cartoon presents a method of remembering the position of the racket at the completion of the backswing phase of the service.[55]

III. SUBJECTS USED TO DETERMINE KNOWLEDGE IMPARTED BY CARTOON ILLUSTRATION

Ninety-six seventh, eighth, and eleventh grade males and eighty-two college males and females served as subjects in an attempt to compare the value of cartoon illustration in imparting knowledge of beginning tennis fundamentals.

Each grade was composed of two separate sections of beginning tennis classes, while the college subjects were enrolled in four beginning tennis classes.

Five of the classes were taught beginning tennis fundamentals with the aid of the cartoon illustrated book. The other five classes were taught identical content in beginning tennis fundamentals, but without the use of the

---

[54] Ibid., p. 28.

[55] Ibid., p. 37.

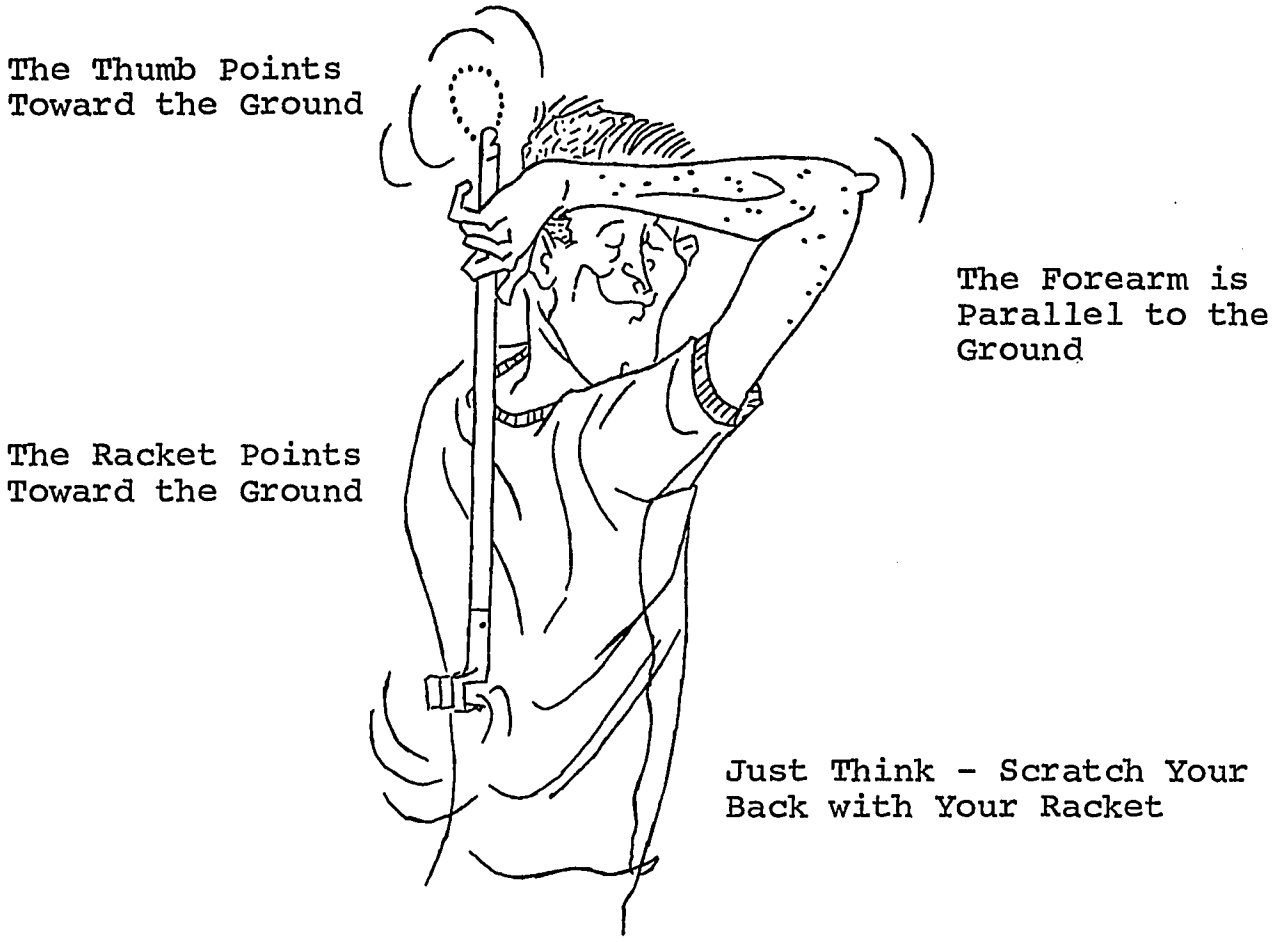


Figure 4

Method Used to Depict the Position of the Racket
at Completion of Backswing Phase of
the Service

cartoon illustrated book. (See Table I.)

TABLE I

NUMBER OF STUDENTS AT THE VARIOUS EDUCATIONAL LEVELS WHO WERE TAUGHT WITH AND WITHOUT CARTOON ILLUSTRATIONS OF TENNIS FUNDAMENTALS AS A VISUAL AID

Method of Instruction	Grade Levels			College Classes		Total
	7	8	11	1 & 2	3 & 4	
With cartoon illustrated book	16	16	16	19	20	87
Without cartoon illustrated book	16	16	16	20	23	91

IV. PROGRESSION OF TEACHING BEGINNING TENNIS FUNDAMENTALS

None of the subjects had ever received any previous instruction in beginning tennis fundamentals at any educational level. All ten classes were taught by the same instructor for twelve, thirty minute sessions. During the twelve meetings the following fundamentals were taught in this order: (1) nomenclature of racket, forehand and backhand grips; (2) pivoting right and left, reverse pivot, ready position; (3) forehand backswing, forward swing, contact, and follow-through; (4) same as previous session; (5) backhand backswing, forward swing, contact, and follow-through; (6) same as previous session; (7) service stance, grip, toss, backswing, contact, and follow-through; (8) same as previous session; (9) same as previous session;

(10) review of all beginning tennis fundamentals taught in first nine sessions; (11) same as previous session; (12) same as previous session.

One week following the twelfth session a knowledge test was administered to all subjects covering the beginning tennis fundamentals taught them during the twelve sessions.

V. DEVELOPMENT AND USE OF KNOWLEDGE TEST

In order to assess the amount of knowledge of beginning tennis fundamentals that was acquired by the students either with or without the aid of a cartoon illustrated book, a written, multiple response test (see Appendix A) was devised. This test was submitted by the investigator to a group of educators on his graduate committee for revision several times before it was finalized.

In the test, a statement concerning a fundamental was followed by a number of responses which completed the statement. Any number of responses could be true, and in order to make the response, the student simply circled the letter to the left of any statement he believed to be true. Thirty-nine of the responses on the test were printed, while seventeen were illustrative. Twenty-eight, or fifty per cent of the total responses were correct.

VI. SUBJECTS AND INSTITUTIONS EVALUATING EFFECTIVENESS OF CARTOON ILLUSTRATIONS AS A TEACHING AID

Twenty-six teachers in eight secondary schools and seven colleges instructed 671 beginning tennis students with the aid of the cartoon illustrated book. Of the teachers participating in this study, there was an equal number from each sex. Ten instructors taught at the secondary level, while sixteen were serving in college teaching. The average age of the male instructors was thirty-six as opposed to thirty-two for the female instructors. The range in age for all teachers was twenty-two to sixty-three years, and in teaching experience the range was two to forty-one years. Thirteen teachers held bachelor's degrees. Twelve teachers had completed master's degrees, and one held the doctorate degree. Each teacher and student had his own copy of the book during instruction in beginning tennis fundamentals. Table II gives a breakdown of the schools, teachers, and students cooperating in the study.

Each of the twenty-six teachers cooperating in the study was contacted by the investigator well in advance of their respective tennis courses. Copies of the book were left for the students at this time. It was explained to the teachers that the book would be used as an aid in the teaching and learning of beginning tennis fundamentals. It was suggested that the book be taken to the tennis courts by the

teacher each time the class met to insure that each student would have his own copy at all times. It was further suggested to the teachers that they use the book in whatever manner they felt best complimented their own teaching abilities and methods. All teachers understood that questionnaires would be used to evaluate what they and their students felt about the use of cartoon illustration in the teaching and learning of beginning tennis fundamentals.

TABLE II

NUMBER OF TEACHERS AND STUDENTS AT THE SECONDARY AND COLLEGE LEVEL WHO PARTICIPATED IN EVALUATING CARTOON ILLUSTRATIONS AS AN AID IN THE TEACHING AND LEARNING OF BEGINNING TENNIS FUNDAMENTALS

Educational Institutions		Teachers		Students	
Level	Number	Male	Female	Male	Female
Secondary	8	3	7	120	258
College	7	10	6	210	103
Total	15	13	13	330	361

VII. DEVELOPMENT AND USE OF QUESTIONNAIRES

Separate questionnaires were developed for teachers and students to evaluate their teaching and learning respectively, in conjunction with the use of the cartoon illustrated book in the twenty-six beginning tennis classes. These questionnaires were submitted by the investigator to

a group of educators on his graduate committee for revision several times before they were finalized.

The questionnaire for evaluation of cartoon illustration in teaching tennis fundamentals (see Appendix D) was sent out to sixteen college teachers and ten secondary teachers upon termination of their respective beginning tennis courses. The teacher questionnaire was divided into nine headings. Under the first four headings, statements were made and responses checked on a five-point rating scale. These headings were: (1) preparation; (2) presentation; (3) use; and (4) relationship of cartoon illustrations and word descriptions. Under four other headings there were questions about the cartoon illustrated booklet which the teacher answered by checking and fill-in type responses. These headings were: (1) content; (2) confusing elements; (3) worthwhileness; and (4) recommendation for future use. In addition, the teachers were also asked to check the extent of their personal experience in tennis.

The twenty-six teachers cooperating in this part of the study administered the questionnaire for evaluation of cartoon illustrations in learning tennis fundamentals (see Appendix E) to their respective 313 college students and 378 secondary students. The student questionnaire was broken down into four headings. Under two of the headings statements were made and responses checked on a five-point rating scale. These headings were: (1) use; and (2) relationship

of cartoon illustrations and word descriptions. Under the other two headings the cartoon illustrated booklet was evaluated by objective type responses. These headings were: (1) presentation and demonstration; and (2) worthwhileness.

Both the teacher questionnaire and student questionnaire were taken in silence and without influence or consultation. No names were asked for on either questionnaire, but certain background information pertinent to the study was requested of both teachers and students. All questionnaires were returned to the investigator immediately following their completion.

VIII. STATISTICAL ANALYSIS

Two statistical designs were employed to determine if significant differences in knowledge resulted when students were taught tennis fundamentals with and without cartoon illustration.

A two by three factorial design was employed in an effort to ascertain whether or not significant differences existed between teaching beginning tennis fundamentals with and without cartoon illustration at three grade levels. Interaction between the two methods of instruction and three classifications of students was also analyzed.

An analysis of variance using a hierarchical (nested) classification was employed with four coeducational college groups; two groups of which were taught with and two without

cartoon illustration. This statistical design sought to determine if significant differences existed between: (1) the two methods of instruction; (2) classes within the methods; and (3) sexes regardless of the methods.

The four sections of the teacher questionnaire regarding preparation, presentation, use, and the relationship of cartoon illustration to word description contained a total of thirty statements which were answered on a five-point rating scale. A two by two by three factorial design was employed with each of these statements to determine if significant differences existed between teachers evaluating their teaching with the aid of the cartoon illustrated book of tennis fundamentals. Male and female teachers represented one factor; the educational level at which the persons were teaching, secondary or college, represented another factor; three ranges of teaching experience; two to five years, six to twelve years, and thirteen to forty-one years represented the third factor. Interactions between the two sexes, two teaching classifications, and three categories of years teaching experience were also analyzed.

The evaluation by all teachers (N = 26) of those sections of the teacher questionnaire having to do with content, confusing elements, and worthwhileness of the cartoon illustrated text; as well as recommendations for the future use of cartoon illustration were converted to per cent and analyzed. The personal tennis experience of each teacher

cooperating in the study was also reported.

Two sections of the student questionnaire concerning use of the cartoon illustrated booklet and the relationship of cartoon illustrations to word descriptions contained a total of eleven statements which were answered on a five-point rating scale. A two by two factorial design was utilized to ascertain if significant differences existed between male and female students, and between the two educational levels of secondary or college classification. Interaction between the two sexes and two levels of educational classification was also analyzed.

The evaluation by all students (N = 691) of those sections of the student questionnaire dealing with presentation and demonstration of cartoon illustrated tennis fundamentals by their respective teachers; as well as the evaluation of the various chapters of the cartooned booklet were analyzed in terms of per cent of total responses.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

I. INTRODUCTION

Two statistical designs were used in this study to compare the effectiveness of supplementing instruction with a cartoon illustrated booklet concerning the fundamentals of tennis with traditional methods without such visual aids.

An analysis of variance utilizing a two by three factorial design was employed to determine differences between the two methods of instruction with seventh, eighth, and eleventh grade males. This design was used also to determine if any interaction existed between the two methods of instruction and three grade classifications.

An analysis of variance with a hierarchical classification was employed with four coeducational college groups; two groups each taught with the different methods of instruction. This design sought to determine if differences existed: (1) between the two methods of instruction; (2) between classes within each method; and (3) between sexes.

II. ANALYSIS OF VARIANCE AND ORTHOGONAL COMPARISONS OF TENNIS KNOWLEDGE SCORES OF SEVENTH, EIGHTH, AND ELEVENTH GRADE BOYS TAUGHT WITH AND WITHOUT THE CARTOON ILLUSTRATED BOOKLET

Equal groups of sixteen males taught identical fundamentals with and without cartoon illustrations from the seventh, eighth, and eleventh grades (N = 96) were administered a knowledge test upon termination of twelve meetings of instruction and a one week waiting period. An analysis of variance utilizing a two by three factorial design was used to determine if differences existed between the two methods of instruction (Factor A) and among the three grade levels (Factor B). Interaction between Factor A and Factor B was also tested for significance. As seen in Table III, the F-ratios for A, B, and A x B respectively were .81, 4.40, and .93. Factors A and A x B were not significant. Factor Bwas significant at the .05 level. This was interpreted to mean that there was no significant difference in knowledge acquired by the groups taught with and without the cartoon illustrated booklet (Factor A). Since the interaction was non-significant, this meant that the difference between the two methods of instruction was uniform at all three grade levels. It was further interpreted that significant difference in knowledge did exist among the grade levels taught with both methods of instruction.

TABLE III

ANALYSIS OF VARIANCE ON KNOWLEDGE TEST SCORES IN TENNIS FUNDAMENTALS OF SEVENTH, EIGHTH, AND ELEVENTH GRADE MALES TAUGHT WITH AND WITHOUT THE CARTOON ILLUSTRATED BOOKLET

Source of Variation	SS	df	M^2	F	P
A (methods)	16.05	1	16.05	.81	NS
B (grades)	172.35	2	86.17	4.40	.05
A x B	36.61	2	18.30	.93	NS
Error	1762.69	90	19.58		

F needed for significance with 1 and 90 degrees of freedom: .05 level, 3.95; .01 level, 6.92.

F needed for significance with 2 and 90 degrees of freedom: .05 level, 3.10; .01 level, 4.85.

In order to further investigate the significant F-ratio among grade levels (Factor B), orthogonal comparisons were undertaken to determine the nature of the differences among grade levels. The knowledge test scores for each of the three grades were used, and two comparisons (N-1) were made. The pattern used for comparisons is shown below:

Total Test Scores	1151	1220	1254
Comparisons	Seventh Grade	Eighth Grade	Eleventh Grade
C_1 (7 & 8 vs. 11)	+1	+1	-2
C_2 (7 vs. 8)	+1	-1	0

The first comparison determined if there was a significant difference between the mean scores obtained on the knowledge test when comparing grades seven and eight with eleven. The second comparison sought to determine if there was significance in mean scores obtained on the knowledge test between grades seven and eight. When the orthogonal comparisons were computed, it was found that the F-ratio for C_1 was 4.99 which was significant at the .05 level. The second comparison yielded an F-ratio of 3.79 which was not significant. Refer to Table IV for presentation of these data.

TABLE IV

ORTHOGONAL COMPARISONS OF KNOWLEDGE TEST SCORES FOR SEVENTH, EIGHTH, AND ELEVENTH GRADE MALES

Source of Variation	SS	df	M^2	F	P
C_1 (7 & 8 vs. 11)	97.75	1	97.75	4.99	.05
C_2 (7 vs. 8)	74.39	1	74.39	3.79	NS
Error	172.14	90	19.58		

F needed for significance with 1 and 90 degrees of freedom: .05 level, 3.95; .01 level, 6.92.

These data were interpreted to mean that the combined mean scores obtained on the knowledge test by grades seven and eight were significantly lower than the mean score obtained by grade eleven. Furthermore, there was no significance between the mean scores obtained on the knowledge test between grades seven and eight.

III. ANALYSIS OF VARIANCE WITH A HIERARCHICAL CLASSIFICATION

An analysis of variance using a hierarchical (nested) classification was employed with four coeducational college groups (N = 82) taught identical tennis fundamentals with different methods of instruction. Two groups were taught tennis fundamentals with cartoon illustrations and two groups were taught identical fundamentals in the traditional manner. The results of a knowledge test given after twelve meetings of instruction and a one week waiting period were compared to determine if significant differences existed between: (1) the two methods of instruction; (2) classes within the methods; and (3) sexes regardless of the methods.

As shown in Table V, the F-ratios of .0056 for Methods indicated no significant difference in knowledge of tennis fundamentals between groups taught with (Mean = 40.84) and without (Mean = 40.72) cartoon illustrations.

TABLE V

ANALYSIS OF VARIANCE ON KNOWLEDGE TEST SCORES OF FOUR COEDUCATIONAL COLLEGE GROUPS TAUGHT WITH AND WITHOUT THE CARTOON ILLUSTRATED BOOKLET

Source of Variation	SS	df	M^2	F	P
Methods	.31	1	.31	.0056	NS
Groups/Methods	110.68	2	55.34	1.37	NS
Sexes/Groups/ Methods	161.04	4	40.26	2.91	.05
Within	1022.02	74	13.81		
Total	1294.05	81			

F needed for significance with 1 and 74 degrees of freedom: .05 level, 3.96; .01 level, 6.96.

F needed for significance with 2 and 74 degrees of freedom: .05 level, 3.11; .01 level, 4.88.

F needed for significance with 4 and 74 degrees of freedom: .05 level, 2.49; .01 level, 3.56.

The means for classes taught with cartoon illustrations were 42.47 and 39.30; for those taught without cartoon illustrations the means were 41.30 and 40.21. An F-ratio of 1.37 for Groups/Methods indicated no significant difference in knowledge of tennis fundamentals among classes within the groups taught with and without cartoon illustrations. An F-ratio of 2.91 for Sexes/Groups/Methods was significant at the .05 level. This was interpreted to mean that males (Mean = 42.32) scored significantly higher on the knowledge test than females (Mean = 40.10) regardless of the method of instruction.

IV. EVALUATION OF CARTOON ILLUSTRATION IN TEACHING TENNIS FUNDAMENTALS

The initial thirty statements on the teacher questionnaire (Appendix D) evaluated The Beginner's Self Instruction Book of Tennis Fundamentals regarding (1) preparation; (2) presentation; (3) use; and (4) relationship of cartoon illustration to word description. All teachers (N = 26) answered each statement on a one to five rating scale. A least squares analysis of variance utilizing a two by two by three factorial design was employed with each statement. Factors A (sex), B (secondary or college classification), and C (three ranges of teaching experience) were

tested for significance. Interactions among these factors were also analyzed. Of 186 F-tests computed, eleven were found to be significant under three of the four main headings. These were: (1) five significant F-ratios with regard to the teachers' reactions toward the use of the cartoon booklet as an only source and as a supplement in preparation; (2) five significant F-ratios concerning use of the cartoon booklet in improving teaching organization, and the value of the booklet in promoting student rapport and facilitating rate of learning; and (3) one significant F-ratio relating to the degree to which cartoon illustrations was deemed sufficient by themselves. No significant findings were found under the heading of presentation.

Four additional sections of the questionnaire provided for evaluation of the cartoon booklet as to content, confusing elements, worthwhileness, and recommendation for future use. The responses under these headings were converted to per cent and analyzed. In addition, the personal tennis experience of the teachers cooperating in the study was reported.

Preparation

Statement two concerned the extent that the cartoon booklet was utilized by the teachers as the only source in

preparing to teach tennis fundamentals. Table VI indicates factors A and B yielded F-ratios of 9.01 and 11.00 respectively, both significant at the .01 level. Factor C yielded an F-ratio of 6.21 and was significant at the .05 level. This was interpreted to mean that: (1) male teachers (Mean = 4.04) used the booklet as the only source for class preparation significantly more than female teachers (Mean = 2.58); (2) secondary teachers (Mean = 4.26 used the booklet as the only source in preparing significantly more than college teachers (Mean = 2.36); and (3) significant differences existed somewhere among the three categories of years of teaching experience in using the booklet as the sole source in preparation. Regression trends using orthogonal comparisons were undertaken to determine where the significance existed. The comparisons for linear and quadratic regression patterns are presented below:

Comparisons	2-5 Years	6-12 Years	13-41 Years
C_1 Linear	+1	0	-1
C_2 Quadratic	+1	-2	+1

In Table VI, it is shown that the F-ratio for linearity was 9.36 and was significant at the .01 level. The

quadratic comparison yielded an F-ratio of 3.06 which was not significant. The significant linear pattern can be interpreted to mean that the more years of experience the teachers had, the more they used the booklet as the only source in preparation during this study. Figure 5 depicts this relationship.

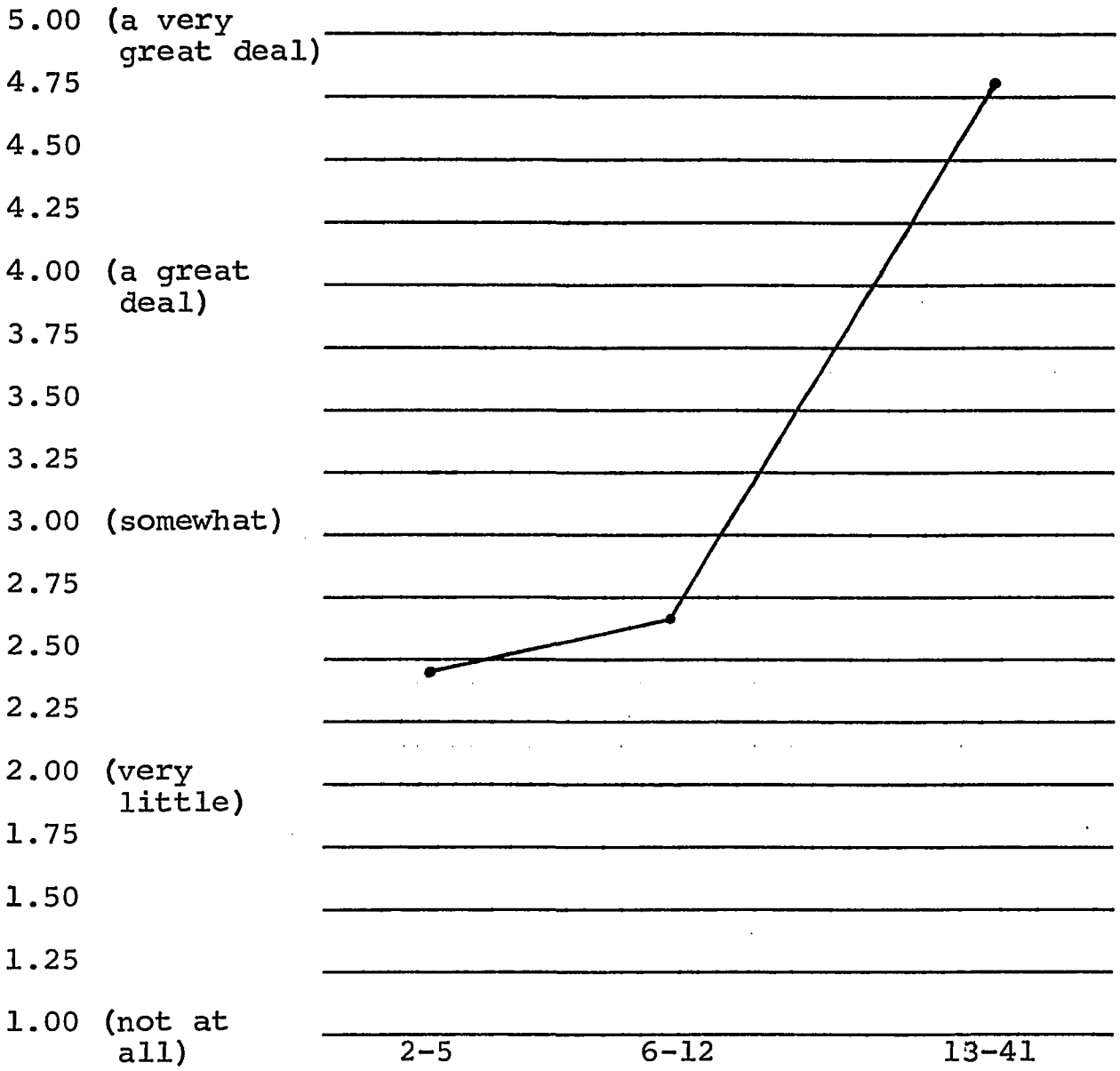
TABLE VI

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE USE OF THE CARTOON BOOKLET AS THE ONLY SOURCE IN PREPARING TO TEACH TENNIS FUNDAMENTALS BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

Source of Variation	SS	df	M^2	F	P
A (Sex)	9.06	1	9.06	9.01	.01
B (School)	11.06	1	11.06	11.00	.01
C (Experience)	12.49	2	6.24	6.21	.05
Linear	9.41	1	9.41	9.36	.01
Quadratic	3.07	1	3.07	3.06	NS
AB (Sex x School)	3.74	1	3.74	3.72	NS
AC (Sex x Experience)	2.00	2	1.00	.99	NS
BC (School x Experience)	6.16	2	3.08	3.06	NS
Error	16.08	16	1.00		

F needed for significance with 1 and 16 degrees of freedom: .05 level, 4.49; .01 level, 8.53.

F needed for significance with 2 and 16 degrees of freedom: .05 level, 3.63; .01 level, 6.23.



Mean score for category 1 (2-5 years teaching experience) : 2.47.

Mean score for category 2 (6-12 years teaching experience) : 2.64.

Mean score for category 3 (15-41 years teaching experience) : 4.81.

Figure 5

Linear Regression Pattern Between Experience of the Teachers and Rating Given Concerning the Use of the Cartoon Booklet as the only Source for Preparing to Teach Tennis Fundamentals

Statement three evaluated the cartoon booklet as to the degree it was used as a supplement to the required text. Factor B yielded an F-ratio of 5.34, which was significant at the .05 level. This indicated that college teachers (Mean = 3.77) used the booklet as a supplement to the required text significantly more than secondary teachers (Mean = 2.36). Refer to Table VII for these data.

TABLE VII

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE USE OF THE CARTOON BOOKLET AS A SUPPLEMENT TO THE REQUIRED TEXT IN TEACHING TENNIS FUNDAMENTALS BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

Source of Variation	SS	df	M^2	F	P
A (Sex)	.05	1	.05	.04	NS
B (School)	6.10	1	6.10	5.34	.05
C (Experience)	2.51	2	1.25	1.09	NS
AB (Sex x School)	1.58	1	1.58	1.39	NS
AC (Sex x Experience)	1.91	2	.95	.83	NS
BC (School x Experience)	.16	2	.08	.07	NS
Error	18.28	16	1.14		

F needed for significance with 1 and 16 degrees of freedom: .05 level, 4.49; .01 level, 8.53.

F needed for significance with 2 and 16 degrees of freedom: .05 level, 3.63; .01 level, 6.23.

Use

Statement fourteen sought to determine if the cartoon booklet created additional rapport with the students

in the twenty-six classes in which it was used. Table VIII indicates that factor C yielded an F-ratio of 5.59, indicating that a significant difference existed somewhere among the three groups of teachers classified according to years teaching experience. Orthogonal comparisons were employed to determine whether significant linear regression existed between the responses and years experience, or whether there was a significant deviation from linearity. The F-ratio for linearity was .01 and was not significant. The quadratic comparison yielded an F-ratio of 11.16 and was significant at the .01 level. This revealed that teachers with a moderate degree of experience felt that the use of the cartoon booklet created more rapport in their classes than did the combined opinions of the teachers with little experience. Figure 6 provides graphic presentation of this relationship.

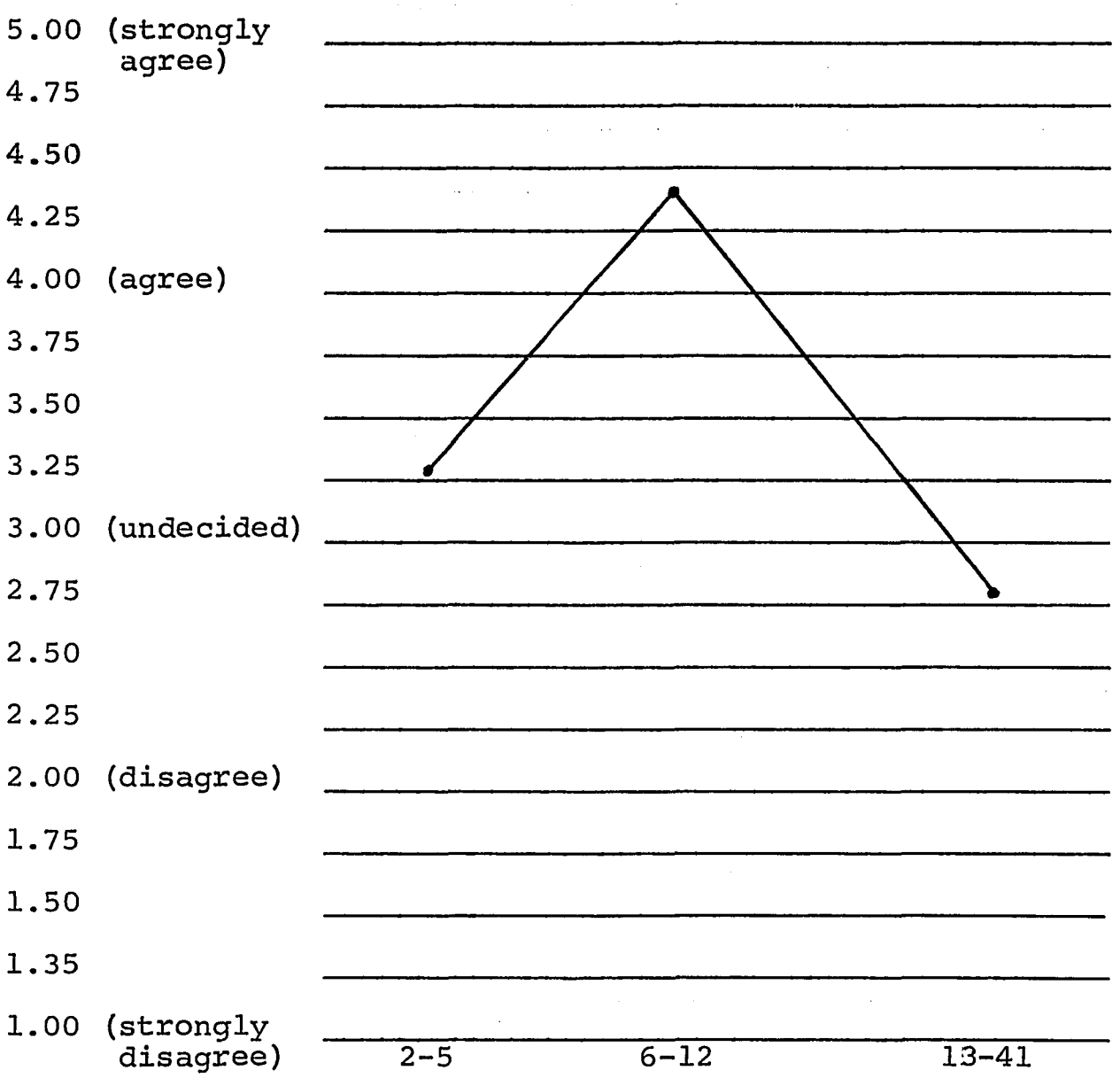
TABLE VIII

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE AMOUNT OF STUDENT RAPPORT CREATED BY TEACHING TENNIS FUNDAMENTALS WITH A CARTOON BOOKLET BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

Source of Variation	SS	df	M^2	F	P
A (Sex)	1.23	1	1.23	2.46	NS
B (School)	1.42	1	1.42	2.84	NS
C (Experience)	5.61	2	2.80	5.59	.05
Linear	.00	1	.00	.01	NS
Quadratic	5.60	1	5.60	11.16	.01
AB (Sex x School)	.00	1	.00	.01	NS
AC (Sex x Experience)	.45	2	.22	.45	NS
BC (School x Experience)	3.36	2	1.68	3.35	NS
Error	8.03	16	.50		

F needed for significance with 1 and 16 degrees of freedom: .05 level, 4.49; .01 level, 8.53.

F needed for significance with 2 and 16 degrees of freedom: .05 level, 3.63; .01 level, 6.23.



Mean score for category 1 (2-5 years teaching experience) : 3.27.

Mean score for category 2 (6-12 years teaching experience) : 4.39.

Mean score for category 3 (15-41 years teaching experience) : 2.80.

Figure 6

Quadratic Regression Pattern Between Experience of the Teachers and Rating Given Concerning the Amount of Student Rapport Created by the Use of a Cartoon Booklet in Teaching Tennis Fundamentals

Statement fifteen asked the teachers the extent to which their organization of tennis knowledge was increased as a result of having used the cartoon booklet in teaching tennis fundamentals. Table IX shows the BC factor yielded an F-ratio of 5.42, which was significant at the .05 level. This interaction indicated that the more experience the secondary teachers possessed, the less they felt their organization of tennis knowledge was increased by the use of the booklet, whereas the more experience the college teachers had, the more they felt their organization of tennis knowledge was increased by the use of the booklet. Graphic illustration of this finding is presented in Figure 7.

Statement twenty-five asked the teachers the degree to which their students seemed to learn tennis fundamentals faster than previous groups taught as a result of having used the cartoon booklet. As seen in Table X factor C yielded an F-ratio of 3.63, which was significant at the .05 level. This was interpreted to mean that significance existed somewhere among the three categories of years teaching experience. Orthogonal comparisons for regression resulted in a non-significant F-ratio of .05 for linearity. The F-ratio of 7.20 indicated significant quadratic characteristics at the .05 level. As shown in Figure 8, the middle category of teachers, those with between six to twelve years experience,

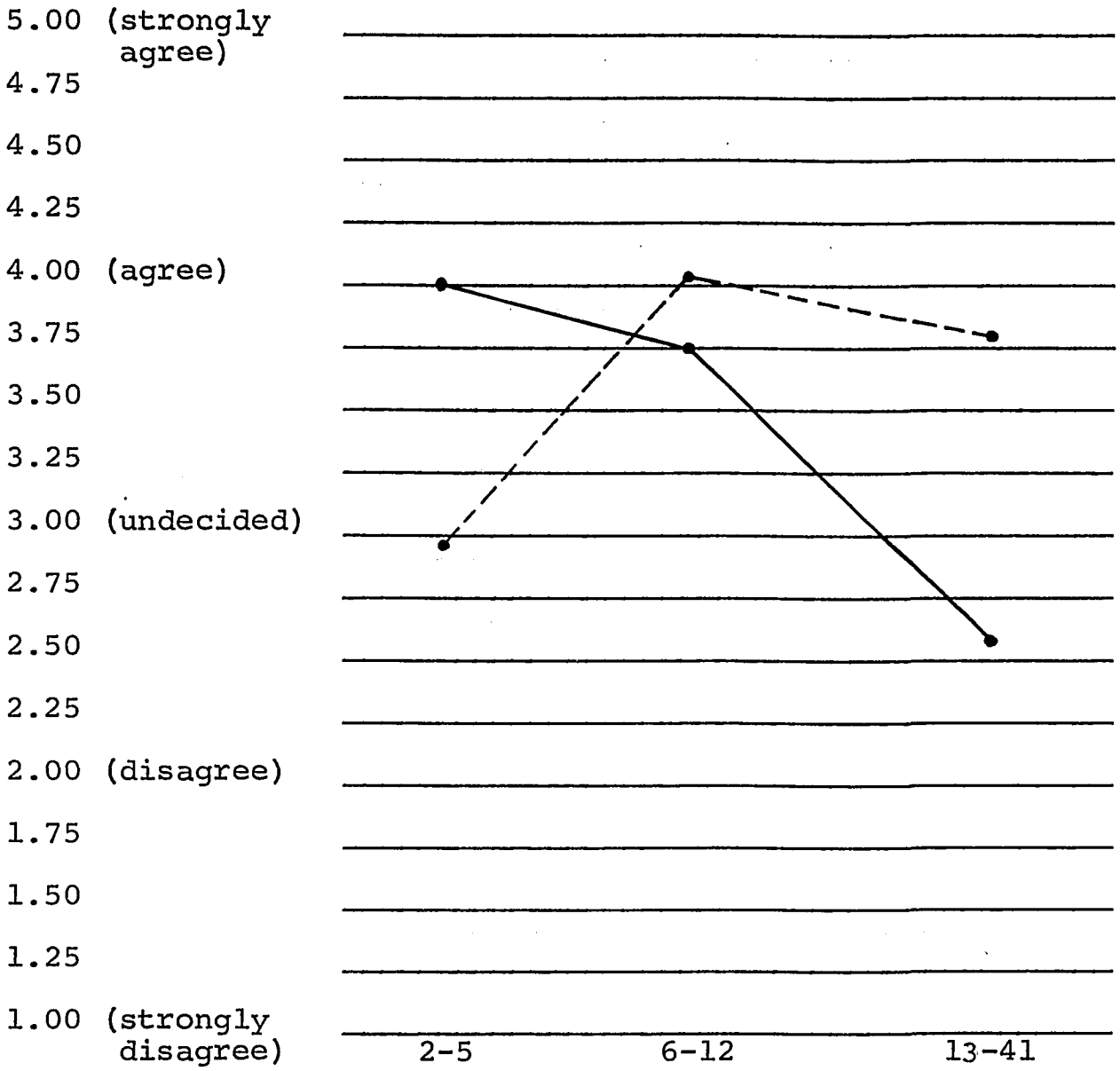
TABLE IX

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING ANY INCREASE IN ORGANIZATION OF TENNIS KNOWLEDGE AS A RESULT OF HAVING USED A CARTOON BOOKLET IN TEACHING TENNIS FUNDAMENTALS BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

Source of Variation	SS	df	M^2	F	P
A (Sex)	.17	1	.17	.59	NS
B (School)	.07	1	.07	.26	NS
C (Experience)	.89	2	.44	1.52	NS
AB (Sex x School)	.11	1	.11	.38	NS
AC (Sex x Experience)	.59	2	.29	1.00	NS
BC (School x Experience)	3.19	2	1.59	5.42	.05
Error	4.71	16	.29		

F needed for significance with 1 and 16 degrees of freedom: .05 level, 4.49; .01 level, 8.53.

F needed for significance with 2 and 16 degrees of freedom: .05 level, 3.63; .01 level, 6.23.



Mean score for category 1 (2-5 years teaching experience) : secondary, 4.00; college, 2.97.

Mean score for category 2 (6-12 years teaching experience) : secondary, 3.75; college, 4.02.

Mean score for category 3 (15-41 years teaching experience) : secondary, 2.60; college, 3.83.

Figure 7

Illustration of Interaction Between Years of Experience and Level of Teaching with Respect to the Extent to Which the Teachers Believed the Booklet Increased Organization of Tennis Knowledge

felt their students learned tennis fundamentals at a faster rate than previous groups they had taught more so than teachers with little and with a great deal of experience.

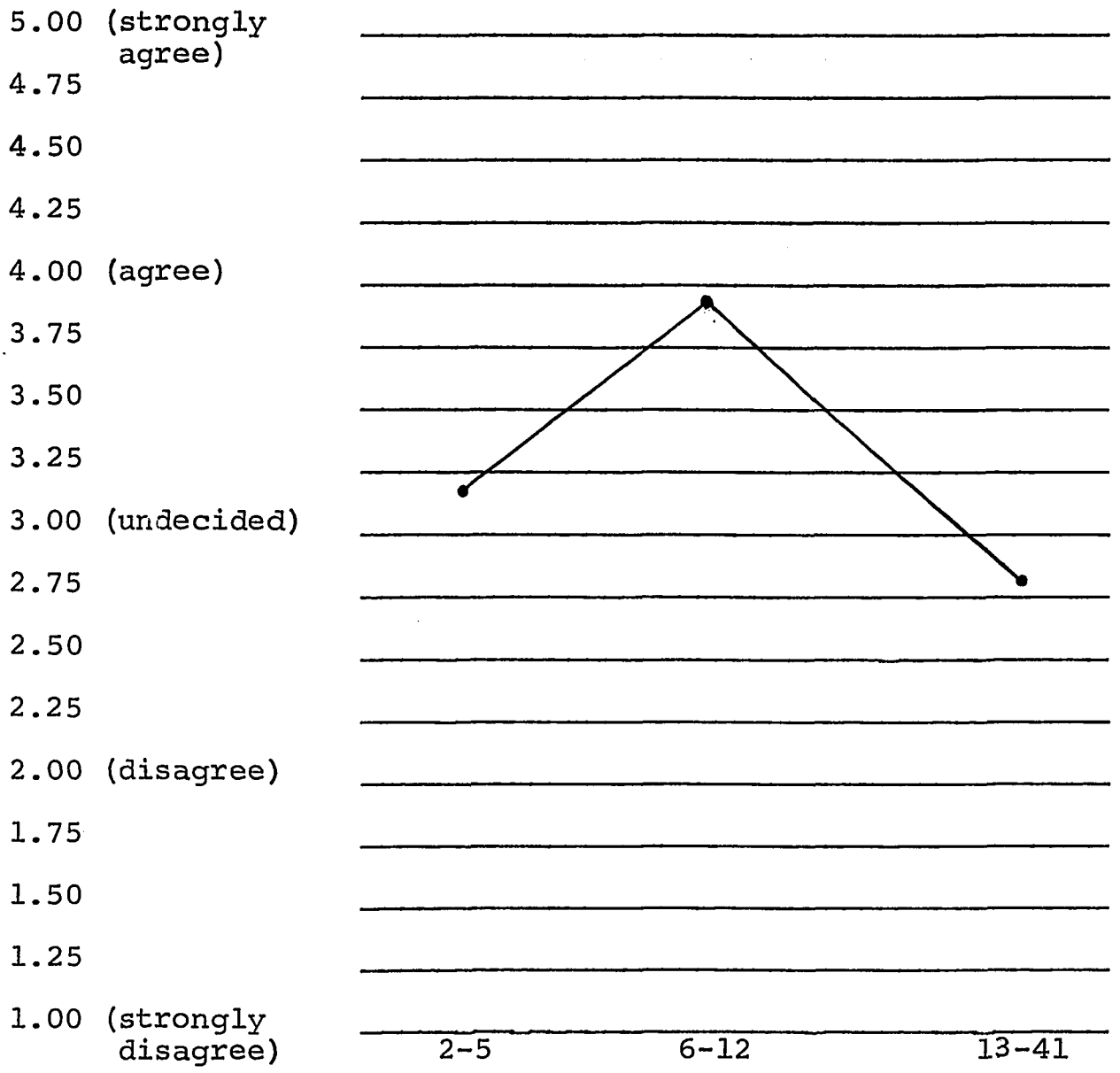
TABLE X

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING OBSERVANCE OF STUDENTS LEARNING TENNIS FUNDAMENTALS FASTER THAN PREVIOUS GROUPS TAUGHT AS A RESULT OF USING THE CARTOON BOOKLET BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

Source of Variation	SS	df	M^2	F	P
A (Sex)	.60	1	.60	1.75	NS
B (School)	.00	1	.00	.00	NS
C (Experience)	2.51	2	1.25	3.63	.05
Linear	.01	1	.01	.05	NS
Quadratic	2.49	1	2.49	7.20	.05
AB (Sex x School)	.30	1	.30	.87	NS
AC (Sex x Experience)	.82	2	.41	1.19	NS
BC (School x Experience)	.01	2	.00	.02	NS
Error	5.53	16	.34		

F needed for significance with 1 and 16 degrees of freedon: .05 level, 4.49; .01 level, 8.53.

F needed for significance with 2 and 16 degrees of freedom: .05 level, 3.63; .01 level, 6.23.



Mean score for category 1 (2-5 years teaching experience) : 3.18.

Mean score for category 2 (6-12 years teaching experience) : 3.90.

Mean score for category 3 (15-41 years teaching experience) : 2.81.

Figure 8

Quadratic Regression Pattern Between Experience of Teachers and Rating Given Concerning the Degree Students Learned Faster Than Previous Groups Taught as a Result of Using a Cartoon Booklet in Teaching Tennis Fundamentals

Relationship of Cartoon Illustration to Word Description

The teachers were asked in statement twenty-nine the degree to which they felt the cartoon illustrations contained in the booklet were sufficient by themselves. Factor A yielded an F-ratio of 5.36, which was significant at the .05 level. This indicated that male teachers (Mean = 2.27) felt cartoon illustrations were sufficient by themselves to a significantly greater degree than female teachers (Mean = 1.80).

TABLE XI

ANALYSIS OF VARIANCE FOR RESPONSE CONCERNING THE DEGREE THAT ILLUSTRATIONS IN A CARTOON BOOKLET ARE SUFFICIENT BY THEMSELVES BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

Source of Variation	SS	df	M^2	F	P
A (Sex)	.95	1	.95	5.36	.05
B (School)	.68	1	.68	3.84	NS
C (Experience)	.32	2	.16	.92	NS
AB (Sex x School)	.01	1	.01	.08	NS
AC (Sex x Experience)	.20	2	.10	.58	NS
BC (School x Experience)	.44	2	.22	1.26	NS
Error	2.83	16	.17		

F needed for significance with 1 and 16 degrees of freedom: .05 level, 4.49; .01 level, 8.53.

F needed for significance with 2 and 16 degrees of freedom: .05 level, 3.63; .01 level, 6.23.

Experience

The teachers cooperating in this study were asked to indicate the extent of their personal experience in tennis. All twenty-six (100 per cent) teachers had taken a tennis course during college. Twenty-one (eighty per cent) teachers learned to teach tennis in a college physical education methods course. Three (eleven per cent) instructors had participated in high school intramural tennis, and three had played for their college varsity team. Five (nineteen per cent) teachers reported having learned to teach tennis following undergraduate preparation, while nine (thirty-four per cent) admitted most of their tennis was self-taught. A complete breakdown of the personal tennis experience of all twenty-six instructors is presented in Table XII.

Content

In rating the content of the four chapters in the cartoon booklet, only eight (thirty per cent) teachers reported fundamentals they felt would make the booklet more complete. In the chapter on basic essentials four teachers indicated that the cross-over step should be illustrated with pivoting. One teacher thought a reverse pivot to position for the backhand stroke should be included. Another teacher felt the continental grip should be illustrated. In the chapter on the forehand stroke, one instructor noted the

TABLE XII

TENNIS EXPERIENCE OF TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS WHO EVALUATED THE EFFECTIVENESS OF TEACHING FUNDAMENTALS WITH CARTOON ILLUSTRATIONS

Experience	Number	Per cent
Member of high school varsity team.	5	19.2
Member of college varsity team.	3	11.5
Received tennis course in high school.	7	26.9
Received tennis course in college.	26	100.
Participated in high school intramural tennis.	3	11.5
Participated in college intramural tennis.	12	46.1
Have been taught private lessons by tennis professional.	8	30.7
Engaged in country club or social tennis.	12	46.1
Learned to teach tennis in college physical education methods course.	21	80.7
Learned to teach tennis after undergraduate preparation.	5	19.2
Most of my tennis is self taught.	9	34.6
Have taught tennis in summer employment.	11	42.3
Have attended tennis clinics.	12	46.1

absence of a stepping illustration during execution of the foreswing. Another teacher mentioned that the chapter on the backswing stroke needed some presentation on how to change to the backhand grip during the backswing phase. In the chapter on the service, one instructor requested cartoon illustration depicting the best height to toss the tennis ball.

Confusing Elements

The instructors were asked to identify any fundamentals presented in the cartoon booklet that appeared confusing. Twenty-five (ninety-six per cent) teachers did not report any such confusing elements, but one teacher felt the cartoon illustrated footprints were difficult to follow in the pivoting section of the chapter on basic essentials.

Worthwhileness

This section asked the teachers to rate the overall value of the cartoon booklet, to rank its chapters in order of preference, and give any chief value or major shortcoming of the booklet concerning its use as a teaching aid.

Fourteen (fifty-four per cent) and ten (thirty-eight per cent) teachers, respectively, rated the cartoon booklet excellent and good. Only two (seven per cent) teachers rated it average. No below average or poor ratings were reported.

Twelve (forty-six per cent) preferred the chapter on basic essentials to all others, and ten (thirty-eight per cent) of these same instructors ranked the chapters on basic

essentials, forehand stroke, backhand stroke, and service one through four respectively. Eleven (forty-two per cent) teachers ranked the chapter on the backhand stroke third, and fifteen (fifty-seven per cent) teachers preferred the chapter on the service least in their rankings. Table XIII gives the rankings and percentages of all four chapters contained in the cartoon booklet.

TABLE XIII

RANKING OF CHAPTERS IN THE CARTOON BOOKLET IN ORDER OF PREFERENCE BY TEN SECONDARY AND SIXTEEN COLLEGE TEACHERS

	Numbers Rankings and Per cent							
Chapters	Ranked First	(%)	Ranked Second	(%)	Ranked Third	(%)	Ranked Fourth	(%)
Basic Essentials	12	46.1	3	11.5	5	19.2	6	23.0
Forehand Stroke	5	19.2	12	46.1	7	26.9	2	7.7
Backhand Stroke	4	15.5	8	30.9	11	42.4	3	11.5
Service	5	19.2	3	11.5	3	11.5	15	57.8

Twenty-two (eighty-four per cent) instructors wrote in what they felt to be the chief values of The Beginner's Self Instruction Book of Tennis Fundamentals as a teaching aid. Simplicity, added interest and motivation of students, and self-use of the booklet when the teacher was instructing elsewhere was brought out most often. The supplementary value of the booklet, especially while demonstrating, was

mentioned, and several teachers indicated that the booklet was an up-to-date, amusing type of visual aid.

Only four (fifteen per cent) teachers listed any major shortcomings of the booklet. One felt it was not logical to carry booklets onto tennis courts during instruction in the fundamentals. Another stated that students would not stop activity to look at the booklet. The remaining two teachers indicated that exclusion of cartoon illustrations depicting scoring and basic drills for each fundamental were shortcomings.

Recommendation

In recommending cartoon illustration for future use in teaching tennis fundamentals, twenty-three (eighty-eight per cent) instructors felt it would be valuable at the secondary level. Twenty-two (eighty-four per cent) recommendations were given for its use at the junior high level. Seventeen (sixty-five per cent) teachers recommended it for college students. Twelve (forty-six per cent) recommendations were given for its use in elementary schools.

V. EVALUATION OF CARTOON ILLUSTRATION BY STUDENTS IN LEARNING TENNIS FUNDAMENTALS

Eleven statements on the student questionnaire (Appendix E) sought to evaluate The Beginner's Self Instruction Book of Tennis Fundamentals with regard to (1) use; and (2) relationship of cartoon illustration to word description. All students answered each statement on a one to five rating scale. A least squares analysis of variance utilizing a two by two factorial design was employed with

each statement. Factors A (sex) and B (secondary or college classification) were tested for significance. Interaction between these factors was also analyzed. Of thirty-three F-tests computed under these two main headings, fourteen were found to be significant. The items to which significant differences were found included: (1) extent of use of the cartoon booklet on the tennis court; (2) use of the cartoon booklet on rainy days; (3) clarification of the execution of fundamentals due to cartoon illustrations; (4) self-use of the cartoon booklet when not being directly taught; (5) stimulation to discuss fundamentals due to use of the cartoon booklet; (6) recall of execution of fundamentals through cartoon illustrations; (7) use of the "Testing Your Knowledge" sections at the end of each chapter in the cartoon booklet; and (8) the degree that cartoon illustrations were deemed sufficient by themselves.

The third section of the questionnaire provided for evaluation of the teachers' presentations and demonstrations in conjunction with the use of cartoon illustrations. The fourth section asked for an evaluation of the worthwhileness of the cartoon booklet. Under this heading the students ranked the chapters in the booklet based on their interest in each; the ways in which they felt they had most effectively learned tennis fundamentals; and indicated their feelings toward the questions at the end of each chapter in the booklet.

Use

Statement one required of the students to indicate the degree to which they used the cartoon booklet while being taught fundamentals on the tennis courts. Factor B yielded an F-ratio of 11.45, and was significant at the .01 level. This indicated that secondary students (Mean = 3.39) used the cartoon booklet more than college students (Mean = 3.12) while being taught fundamentals on the tennis courts. Refer to Table XIV for these data.

TABLE XIV

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE DEGREE THAT THE CARTOON BOOKLET WAS USED BY 378 SECONDARY AND 313 COLLEGE STUDENTS DURING THEIR TENNIS FUNDAMENTALS INSTRUCTION

Source of Variation	SS	df	M^2	F	P
A (Sex)	3.42	1	3.42	3.49	NS
B (School)	11.22	1	11.22	11.45	.01
AB (Sex x School)	1.53	1	1.53	1.57	NS
Error	672.84	687	.97		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 386; .01 level, 6.70.

The amount the cartoon booklet was utilized on rainy days was asked of the students in statement two. An F-ratio of 9.60 for factor B, and an interaction F-ratio of 10.16 both demonstrated significance at the .01 level. As shown

in Table XV, this is interpreted to mean that college students (Mean = 3.02) used the cartoon booklet more on rainy days than secondary students (Mean = 2.66). The interaction established that while college males (Mean = 3.12) used the cartoon booklet more on rainy days than secondary males (Mean = 2.40), the college females used the cartoon booklet approximately the same on rainy days (Mean = 2.91) as did the secondary girls.

TABLE XV

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE AMOUNT OF USE OF THE CARTOON BOOKLET BY 378 SECONDARY AND 313 COLLEGE STUDENTS DURING RAINY DAYS

Source of Variation	SS	df	M^2	F	P
A (Sex)	3.32	1	3.32	1.68	NS
B (School)	18.92	1	18.92	9.60	.01
AB (Sex x School)	20.02	1	20.02	10.16	.01
Error	1353.17	687	1.96		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

The students were questioned in statement three as to the extent that cartoon illustrations clarified the manner in which the tennis fundamentals were to be executed. An F-ratio of 3.97 for factor A indicated significance at

the .05 level. This meant that females (Mean = 4.12) felt cartoon illustrations clarified the manner of execution of tennis fundamentals more than did the males (Mean = 3.97). The AB factor produced an F-ratio of 16.80, which was significant at the .01 level. This interaction illustrated that while college females (Mean = 4.24) endorsed cartoon illustrations in clarifying the manner that tennis fundamentals were to be done more than the college males (Mean = 4.00), the secondary boys (Mean = 4.15) agreed with this statement to a greater extent than did the secondary girls (Mean = 3.80). These data are presented in Table XVI.

TABLE XVI

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE EXTENT THAT THE CARTOON ILLUSTRATIONS CLARIFIED EXECUTION OF FUNDAMENTALS FOR 378 SECONDARY AND 313 COLLEGE STUDENTS

Source of Variation	SS	df	M^2	F	P
A (Sex)	3.02	1	3.02	3.97	.05
B (School)	.36	1	.36	.48	NS
AB (Sex x School)	12.78	1	12.78	16.80	.01
Error	522.57	687	.76		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

The amount of utilization of the cartoon booklet when the students' teachers were instructing on other tennis

courts was rated in statement four. Computation of factor A resulted in an F-ratio of 13.57, and was significant at the .01 level. Females (Mean = 2.25) therefore used the cartoon booklet more than males (Mean = 1.90) when their instructors were teaching on other tennis courts. Table XVII contains these data.

TABLE XVII

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE AMOUNT THE CARTOON BOOKLET WAS USED BY 378 SECONDARY AND 313 COLLEGE STUDENTS WHEN THEIR TEACHERS WERE INSTRUCTING ON OTHER TENNIS COURTS

Source of Variation	SS	df	M^2	F	P
A (Sex)	18.47	1	18.47	13.57	.01
B (School)	.51	1	.51	.37	NS
AB (Sex x School)	3.41	1	3.41	2.50	NS
Error	934.96	687	1.36		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

The extent to which the cartoon booklet stimulated discussion with fellow students was tested in statement five. F-ratios of 7.65 and 6.54 were deemed significant for factors A and B at the .01 and .05 levels, respectively. These findings showed that females (Mean = 2.58) felt that the use of the cartoon booklet stimulated discussion with fellow students more than did the males (Mean = 2.33); and that

secondary students (Mean = 2.57) felt that the use of the cartoon booklet stimulated discussion more so than did college students (Mean = 2.34). These data are given in Table XVIII.

TABLE XVIII

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE EXTENT TO WHICH THE CARTOON BOOKLET STIMULATED DISCUSSION OF FUNDAMENTALS FOR THE 378 SECONDARY AND 313 COLLEGE STUDENTS

Source of Variation	SS	df	M^2	F	P
A (Sex)	9.46	1	9.46	7.65	.01
B (School)	8.10	1	8.10	6.54	.05
AB (Sex x School)	.90	1	.90	.73	NS
Error	849.90	687	1.23		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

In statement seven, the students were asked if they could recall the proper execution of tennis fundamentals as they were cartooned more so than the way they were explained or demonstrated. Females (Mean = 3.57) answered more in the positive for this statement than did males (Mean = 3.36), as was indicated by an F-ratio of 5.76 for factor A which was significant at the .05 level. Factor AB yielded an F-ratio of 12.24 indicating that a significant interaction existed at the .01 level. This revealed that secondary males

(Mean = 3.50) recalled the proper execution of tennis fundamentals as they were cartooned more so than the way they were explained or demonstrated better than secondary females (Mean = 3.22); however with college males (Mean = 3.41) and females (Mean = 3.73) just the opposite was true. Refer to Table XIX for these data.

TABLE XIX

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE ABILITY OF 378 SECONDARY AND 313 COLLEGE STUDENTS TO RECALL EXECUTION OF FUNDAMENTALS AS THEY WERE CARTOONED BETTER THAN THE WAYS THEY WERE EXPLAINED OR DEMONSTRATED

Source of Variation	SS	df	M^2	F	P
A (Sex)	6.54	1	6.54	5.79	.05
B (School)	.06	1	.06	.05	NS
AB (Sex x School)	13.86	1	13.86	12.28	.01
Error	775.13	687	1.12		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

The "Testing Your Knowledge" sections at the end of each chapter in the cartoon booklet received ratings in statement eight. The comparison for factor A revealed as F-ratio of 10.27, which was significant at the .01 level. Computations for factor B yielded an F-ratio of 29.11, which was also significant at the .01 level. This significant comparison for factor A was interpreted to mean that males

(Mean = 3.32) used the "Testing Your Knowledge" sections at the end of each chapter in the cartoon booklet more than females (Mean = 2.92). The factor B comparison revealed that secondary students (Mean = 3.45) used these sections more than college students (Mean = 2.79). These data are presented in Table XX.

TABLE XX

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE DEGREE THAT THE "TESTING YOUR KNOWLEDGE" SECTIONS IN THE CARTOON BOOKLET WERE USED BY 378 SECONDARY AND 313 COLLEGE STUDENTS

Source of Variation	SS	df	M^2	F	P
A (Sex)	23.35	1	23.35	10.27	.01
B (School)	66.18	1	66.18	29.11	.01
AB (Sex x School)	1.29	1	1.29	.56	NS
Error	1561.54	687	2.27		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

Relationship of Cartoon Illustrations and Word descriptions

The degree to which the students felt that cartoon illustrations in the booklet were sufficient in themselves was asked of the students in statement ten. The F-ratio for factor B was found to be 5.92, and significant at the .05 level. This comparison showed that secondary students

(Mean = 2.75) believed that the cartoon illustrations in the booklet were sufficient in themselves more so than college students (Mean = 2.55). The significant interaction for AB indicated that while the secondary males (Mean = 2.95) felt that cartoon illustrations were sufficient in themselves more so than did college males (Mean = 2.54), the college females (Mean = 2.61) felt this statement was true to a greater degree than did secondary females (Mean = 2.49). Table XXI reflects these data.

TABLE XXI

ANALYSIS OF VARIANCE FOR RESPONSES CONCERNING THE DEGREE THAT ILLUSTRATIONS IN A CARTOON BOOKLET WERE BELIEVED TO BE SUFFICIENT BY THEMSELVES BY 378 SECONDARY AND 313 COLLEGE STUDENTS

Source of Variation	SS	df	M^2	F	P
A (Sex)	3.28	1	3.28	3.29	NS
B (School)	5.91	1	5.91	5.92	.05
AB (Sex x School)	10.29	1	10.29	10.31	.01
Error	685.65	687	.99		

F needed for significance with 1 and 687 degrees of freedom: .05 level, 3.86; .01 level, 6.70.

Presentation and Demonstration

Under this heading in the questionnaire, all of the fundamentals in the cartoon booklet were listed, and the students asked to check any fundamentals that their teachers

presented differently or omitted altogether. Ninety-four to 100 per cent of the students did not report any differences or omissions. Those few differences between teacher presentations and similar presentations in the cartoon booklet that were reported dealt with forehand and backhand grips (5.9 per cent), pivoting (5.8 per cent), and toss of the ball on service (5.5 per cent). Fundamentals presented in the cartoon booklet that were omitted during instruction by the teacher were reported even less. The few responses that were reported were toss of the ball on service (4.2 per cent), contact with the ball during execution of the firehand stroke (2.9 per cent), and proper service stance (2.7 per cent).

Worthwhileness

In one phase of the evaluation of the worthwhileness of the cartoon booklet, the students were asked to rank the chapters as to the extent of interest they had for each. The chapters were ranked one through four in order of interest. The chapter on basic essentials was preferred most by 56.3 per cent of the students, followed by the chapters on the backhand stroke (43.4 per cent), forehand stroke (40.8 per cent), and service (32.7 per cent). A complete listing in percentages of student interest for each chapter appears in Table XXII. All students reported for this section.

In the second part of the section concerning worthwhileness of the booklet, the students were asked to rank the ways by which they felt they learned the tennis fundamentals most effectively. The choices were: teacher demonstration, cartoon illustration, other students, and combination of teacher demonstration and cartoon illustration. Compilation of the rankings revealed that teacher demonstration was ranked as being first by the majority (58.7 per cent of the students. Cartoon illustration was ranked as the second most effective way most frequently (36.5 per cent); and this method was also ranked third by more students (39.4 per cent) than any of the other ways. Learning from other students was ranked lowest by more students (52.2 per cent) than any of the other methods. (See Table XXIII.)

TABLE XXII

RANKING OF CHAPTERS IN THE CARTOON BOOKLET IN ORDER OF INTEREST EXPRESSED AS PERCENTAGES OF THE 378 SECONDARY AND 313 COLLEGE STUDENTS

Chapters	Ranked First (in %)	Ranked Second (in %)	Ranked Third (in %)	Ranked Fourth (in %)
Basic Essentials	56.3	12.3	8.5	22.9
Forehand Stroke	9.6	40.8	34.4	15.2
Backhand Stroke	9.7	17.5	43.4	29.4
Service	24.6	29.2	13.5	32.7

TABLE XXIII

PERCENTAGES OF THE 378 SECONDARY AND 313 COLLEGE STUDENTS WHO WERE ASKED TO RANK THE WAYS BY WHICH THEY LEARNED TENNIS FUNDAMENTALS MOST EFFECTIVELY

Ways of Effective Learning	Ranked as being First	Ranked as Second	Ranked as Third	Ranked as Fourth
Teacher demonstration	58.9	27.3	8.9	4.7
Cartoon illustration	7.6	36.5	39.4	16.6
Other students	7.2	10.2	30.2	52.2
Combination of teacher demonstration and cartoon illustration	26.2	26.6	21.4	26.2

The final section under this heading asked for evaluations of the "Testing Your Knowledge" questions as the end of the four chapters in the cartoon booklet. The students checked one or more of the four statements contained in this section that they believed to be proper assessment of their feelings toward the questions. Seventy-two per cent of the students felt that the "Testing Your Knowledge" questions provided a good review of the fundamentals presented in each chapter of the cartoon booklet. Fifteen per cent believed that other type questions in addition to multiple-choice items should be included. Five per cent indicated that the questions were too simple, and eight per cent did not believe that the questions contributed to the learning of tennis fundamentals.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS

I. SUMMARY

The purpose of this study was twofold: (1) It was the purpose of this study to determine the comparative effectiveness of teaching a motor skill with and without the use of a cartoon illustrated booklet as a teaching aid, as indicated by performance on a knowledge test; and (2) It was the purpose of this study to evaluate the receptiveness and educational worth of cartoon illustration as an aid in the teaching and learning of a motor skill, from the standpoint of both teachers and students.

Ninety-six seventh, eighth, and eleventh grade males at University Laboratory School, Baton Rouge, Louisiana, and eighty-two coeducational students at Louisiana State University served as subjects to determine the value of cartoon illustration in imparting knowledge of beginning tennis fundamentals. Each grade was composed of two separate sections, while the college students were enrolled in four sections. Five sections were taught beginning tennis fundamentals for twelve, thirty minute sessions using the cartoon booklet; and five classes were taught identical fundamentals in the same time period without the cartoon

booklet. Following a one week waiting period, a multiple-response knowledge test was administered to all subjects. A two by three factorial analysis of variance with planned orthogonal comparisons was employed with the seventh, eighth, and eleventh grade students. This design sought to determine differences in methods of instruction, grade levels, and interaction of these factors. An analysis of variance utilizing a hierarchical classification was employed with the college students. This design was used to determine differences between methods of instruction, classes within the methods, and sexes regardless of method.

Twenty-six teachers and their respective 671 students in eight secondary schools and colleges in Louisiana utilized the cartoon booklet in classes of beginning tennis fundamentals. Following these regular courses of instruction, teacher and student questionnaires were employed to evaluate the effectiveness of the cartoon booklet. Using a two by two by three factorial analysis of variance with regression orthogonal comparisons, teaching evaluations were analyzed using sex, instructional classification, and years of teaching experience. Interactions of these factors were also analyzed. The students' evaluations were partly analyzed from the use of a two by two factorial analysis of variance based on sex and school classification. Those parts of the teacher and student questionnaires not evaluated by statistical methods were analyzed and interpreted in terms of per cent of total responses.

II. FINDINGS

As a result of the data obtained in this study, the findings were summarized as follows:

1. There was no difference in scores on a knowledge test of tennis fundamentals of students taught with and without cartoon illustrations used as a teaching aid.
2. It was found that the knowledge test scores of the eleventh grade students was significantly higher than the scores of the seventh and eighth graders, and that college males scored higher on the knowledge test than college females, regardless of whether or not cartoon illustrations were used as a teaching aid.
3. It was found that male teachers, teachers with more experience, and teachers at the secondary level utilized the booklet more in their class preparations than did female teachers, teachers with less experience, and college teachers. College teachers utilized the booklet as a supplement in their preparation for classes significantly more than did the secondary teachers.
4. Teachers with six to twelve years of experience reported that they found that cartoon illustrations created additional rapport with the students and promoted faster learning more so

than did the teachers with little experience and teachers with considerable experience.

5. Ninety-three per cent of the teachers rated cartoon illustrations as good or excellent as a teaching aid.
6. The chapter on Basic Essentials was rated most valuable by both the teachers and students.
7. Overall, female students used the cartoon illustrated booklet more and felt that it stimulated discussion more than the males, and secondary students utilized the booklet and felt it stimulated discussion more than the college students.
8. The female students believed the cartoon illustrations clarified instruction and that they were better able to recall information to a greater degree than the male students. However, a significant interaction was found in that the secondary boys believed this to be true more so than the secondary girls.

III. DISCUSSION

Since this investigator was the teacher in the phase of the study which sought to compare the effectiveness of the teaching of tennis with and without the cartoon illustrated booklet, several subjective observations seemed to

be in order.

It was the opinion of this investigator that those students in the classes which utilized the cartoon illustrations seemed to be more interested and motivated. No significant differences, however, were found between the two methods of instruction at any educational level. The significant difference in knowledge found when grades seven and eight were compared to grade eleven was not unexpected. The fact that the eleventh grade classes scored significantly higher on the knowledge test regardless of the instructional method can probably be attributed to a higher degree of curiosity, congeniality, and enthusiasm exhibited at this level, in addition to other factors such as better reading ability and more experience in test taking.

The findings that males scored significantly better in knowledge of tennis fundamentals than females in four coeducational college classes regardless of instructional method was also expected. It was observed throughout the instructional periods that the males went about learning tennis fundamentals in a more business-like manner, and followed directions more explicitly.

It was evident to this investigator after having visited the twenty-six teachers who evaluated the effectiveness of a cartoon illustrated booklet in teaching beginning tennis fundamentals to their respective classes, that the

female secondary instructors seemed highly interested in this study. Even though the male instructors and teachers at other levels were cooperative and professional in their approach to this study, the secondary females did seem to be more genuinely receptive to the idea of evaluating a relatively new teaching aid.

It came as a pleasant surprise to this investigator that those instructors with moderate or extensive teaching experience rated the cartoon illustrated booklet higher than the less experienced teachers.

IV. CONCLUSIONS

Within the limitations of this study, the following conclusions were made:

1. Cartoon illustrations of the basic fundamentals of a motor skill used to supplement regular instruction apparently do not result in the acquisition of a greater degree of knowledge, as measured by a written objective test, than that which is brought about through explanation and demonstration by the teacher alone.
2. Cartoon illustrations are a valuable aid in class preparation, in teaching, and in supplementing instruction in a motor skill.
3. The use of cartoon illustrations as a teaching aid is generally well received by students at

both the secondary and college levels.

4. Females tend to be more receptive to cartoon illustrations as a supplement in learning a motor skill than do males, and secondary students more so than college students.

BIBLIOGRAPHY

A. BOOKS

Daggett, Betty and Helen Slocum. The Easy Way to Learn Golf Rules. Chicago: National Golf Foundation, 1966.

Davidson, Kenneth and Lenore C. Smith (consultants). Badminton Instructor's Guide. Chicago: The Athletic Institute, 1952.

Gould, Dick. Tennis Anyone. California: The National Press, 1966.

Hoban, Charles F., Jr. Focus on Learning. Washington, D.C.: American Council on Education, 1942.

Leighton, Harry "Cap" (consultant). Tennis Instructor's Guide. Chicago: The Athletic Institute, 1958.

Schramm, William. "The Publishing Process." Text Materials in Modern Education. Edited by Lee J. Cronbach. Urbana, Illinois: University of Illinois Press, 1955.

B. PERIODICALS

Brown, Howard Steven and Lloyd Messersmith. "An Experiment in Teaching Tumbling With and Without Motion Pictures," Research Quarterly, XXIX (December, 1948), 304-307.

Gray, Charles A. and Wayne B. Brumbach. "Effect of Daylight Projection of Film Loops on Learning Badminton," Research Quarterly, XXXVIII (December, 1967), 562-569.

Hainfield, Harold. "Slow Motion Movies for Swimming Coaches," Scholastic Coach, IX (January, 1960), 48.

Hixson, Chalmer G. "The Status and Potential of Instructional Television for Physical Education," Journal of Health, Physical Education, and Recreation, XXXIII (May-June, 1962), 25.

Hupprich, Florence L. "The Use of Visual Aids in Teaching Tennis," Journal of Health, Physical Education, and Recreation, XII (February, 1941), 93.

Lockhart, Aileen. "The Value of the Motion Picture as an Instructional Device in Learning a Motor Skill," Research Quarterly, XV (May, 1944), 181-187.

Lumiere, Cornell. "The Return of Service," World Tennis, XII (February, 1965), 30-32.

_____. "The Doubles Game," World Tennis, XII (April, 1965), 34.

Nelson, Dale O. "Effect of Slow Motion Loopfilms on the Learning of Golf," Research Quarterly, XXIX (March, 1958), 37-45.

Penman, Kenneth A., Bartz, Douglas, and Rex Davis. "Relative Effectiveness of an Instant Replay Videotape Recorder in Teaching Trampoline," Research Quarterly, XXXIX (December, 1968), 1060-1062.

Priebe, Roy E. and William H. Burton. "The Slow Motion Picture as a Coaching Device," School Review, XLVII (March, 1939), 152-158.

Ruffa, Edward. "How Motion Pictures Help the Coach," Athletic Journal, XXVII (May, 1937), 20.

Skubic, Elvera. "Teaching Archery With Audio-Visual Aids," Journal of Health, Physical Education, and Recreation, XX (April, 1949), 284.

Van Der Meer, Dennis. "How to Volley Balls Coming Close to Your Body," World Tennis, XV (December, 1968), 54.

_____. "Backing Up Your Partner," World Tennis, XVI (January, 1969), 31.

Watkins, David L. "Motion Pictures as an Aid in Correcting Baseball Batting Faults," Research Quarterly, XXXIV (May, 1963), 228-233.

C. UNPUBLISHED MATERIALS

Adams, Thurston, "Motion Pictures in Physical Education, Teaching the Tennis Serve with School Made Films" (unpublished Doctoral dissertation, Columbia University, 1939).

Bartruff, Harry L., "The Use of Slow Motion Pictures in Teaching Tumbling" (unpublished Master's thesis, University of Southern California, 1938).

Bonnette, Allen R., "The Development of Educational Media for Hansen's Disease Patients Concerning Protective Care of the Feet" (unpublished Doctoral dissertation, Louisiana State University, 1968).

Caine, John E., "The Effect of Instant Analysis and Reinforcement of Motor Performance Through the Use of Cinematography Techniques Related to Television" (microcarded Doctoral dissertation, Colorado State College, 1966).

Drury, Frances A., "An Evaluation of Visual Aids in the Teaching of Tumbling" (microcarded Doctoral dissertation, State University of Iowa, 1959).

Fowler, Joyce, "The Value of the Slow Motion Picture as an Instructional Aid in the Teaching of Tennis Skills" (unpublished Master's thesis, University of North Carolina, 1955).

Friedrichsen, Friedrich W., "A Study of the Effectiveness of Loop Films as Instructional Aids in Teaching Gymnastic Stunts" (unpublished Master's thesis, State University of Iowa, 1956).

Harby, S. F., "Evaluation of a Procedure for Using Daylight Projection of Film Loops in Teaching Skills" (Instructional Film Research Program, Pennsylvania State College, 1952).

Harless, Ivan L., "A Comparison of Improvement of Selected Motor Skills Utilizing Two Instructional Methods" (unpublished Doctoral dissertation, Louisiana State University, 1969).

_____. "The Development of a Self Instruction Book of Beginning Tennis Skills" (unpublished Master's thesis, Louisiana State University, 1968).

Hawthorne, Martha Ellen, "A Study of the Effectiveness of the Slow Motion Picture in Teaching Golf" (unpublished Master's thesis, Louisiana State University, 1964).

Irwin, June, "The Effect of Selected Audio-Visual Aids on Teaching Beginning Tennis Skill and Knowledge to College Women" (microcarded Doctoral dissertation, Indiana University, 1958).

Jones, Margaret Lois, "The Use of an Experimental Study in Motion Pictures of Individuals as an Instructional Device in Teaching Badminton Techniques" (unpublished Master's thesis, Smith College, 1951).

Karsner, Milo G., "An Evaluation of Motion Picture Loops in Group Instruction in Badminton" (microcarded Doctoral dissertation, State University of Iowa, 1953).

Kern, Rebecca A. "The Value of Visual Aids in Teaching Elementary Diving to College Women" (unpublished Master's thesis, State University of Iowa, 1951).

Klesius, Stephen E., "The Effectiveness of Selected Educational Media in Disseminating Knowledge of the Care and Prevention of Injuries to Insensitive Feet to Diabetics of Different Educational Levels" (unpublished Doctoral dissertation, Louisiana State University, 1968).

Moore, Ballard J., "The Retention of Cartoon Illustrated Tennis Rules" (unpublished Master's thesis, Louisiana State University, 1969).

Murnin, J. A., Hayes, W., and S. F. Harby, "Daylight Projection of Film Loops as the Teaching Medium in Perceptual Motor Skill Training" (Instructional Film Research Program, Pennsylvania State College, 1952).

Olney, June, "The Effect of the Use of Motion Pictures as an Aid in Learning the Kackknife Dive" (unpublished Master's thesis, Macmurray College, 1944).

Plese, Elliot Ray, "A Comparison of Video-Tape Replay with a Traditional Approach in the Teaching of Selected Gymnastic Skills" (microcarded Doctoral dissertation, Ohio State University, 1967).

Rhea, Harold Conrad, "The Value of Video Self-Analysis as a Reinforcement Technique for Learning When Substituted for Actual Practice of Gross Motor Skills" (microcarded Doctoral dissertation, Colorado State College, 1968).

Wyness, Gerald B., A Study of the Effectiveness of Motion Pictures as an Aid in Teaching a Gross Motor Skill" (microcarded Doctoral dissertation, University of Oregon, 1963).

Yarborough, Edna, "A Study of the Effectiveness with which the Motion Picture may be Used in Teaching Undergraduate

College Women Skills of Beginning Field Hockey" (unpublished Master's thesis, Texas State College for Women, 1947).

D. OTHER SOURCES

American Association for Health, Physical Education, and Recreation Lifetime Sports Education Project. Personal interview with William A. Noonan, Jr., Director, Baton Rouge, Louisiana, September 4, 1969.

APPENDICES

APPENDIX A

KNOWLEDGE TEST OF BEGINNING TENNIS FUNDAMENTALS

Secondary student: 7 8 9 10 11 12

College student: Fr So Jr Sr Grad

Sex: M F

The following questions are designed to test your knowledge of beginning tennis fundamentals. Circle the letter to the left of any word or statement you feel is correct. Any number of answers under each question may be correct or incorrect.

EXAMPLE:

Chicago is

A. a city.

B. a town.

C. located in the United States.

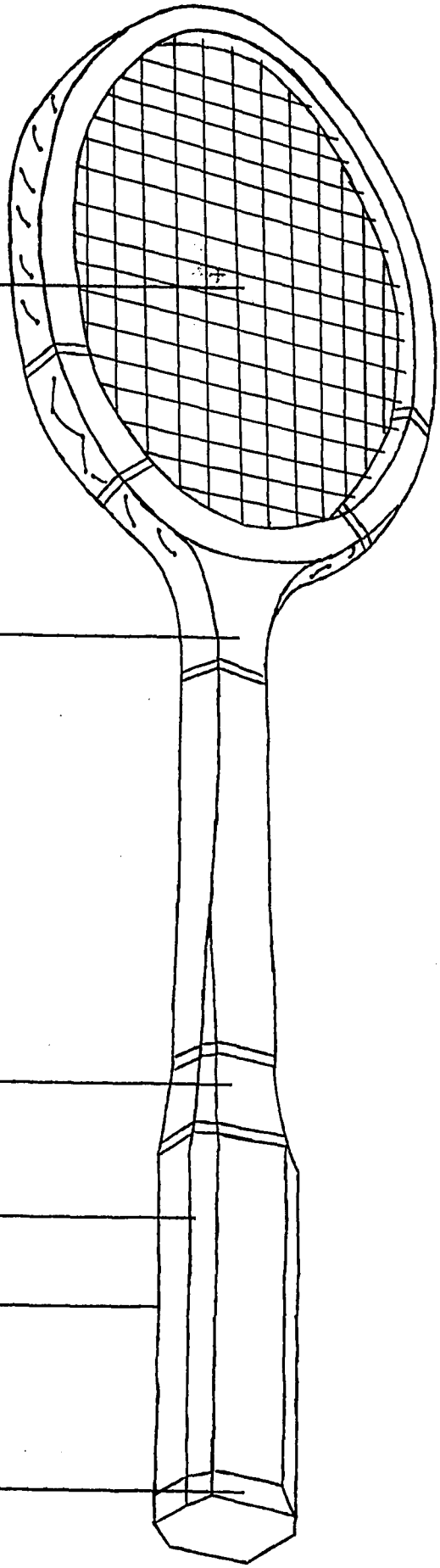
D. a city in Illinois.

E. a town in Europe.

In the example question, answers A, C, and D are correct and would be circled. Answers B and E are incorrect and would not be circled.

- - - - - - - - - - - -

1. Circle those terms that point to the correct part of the racket:



A. face _____

B. frame _____

C. throat _____

D. top _____

E. bevel _____

F. butt _____

2. In the Eastern forehand grip

   A. you "shake hands" with the racket.

   B. the "V" formed by the thumb and forefinger is located on top of the handle.

   C. the racket face is held at an angle of 45 degrees to the ground.

   D. the heel of the hand is on the butt of the handle.

   E. the "V" formed by the thumb and forefinger is located over the bevel on the thumb side of the handle.

3. For the backhand grip

   A. you "shake hands" with the racket.

   B. the "V" formed by the thumb and forefinger is located on top of the handle.

   C. the racket face is held at an angle of 45 degrees to the ground.

   D. the heel of the hand is on the butt of the handle.

   E. the "V" formed by the thumb and forefinger is located over the bevel on the thumb side of the handle.

4. In executing a pivot correctly a player could

   A. step with one foot and pivot with the other.

   B. end the pivot with the body weight equal on the feet.

   C. go through the pivot without ever lifting either foot completely off the ground.

   D. simultaneously pivot on the heel of one foot and the ball of the other foot.

   E. end the pivot with the body weight more on the left foot.

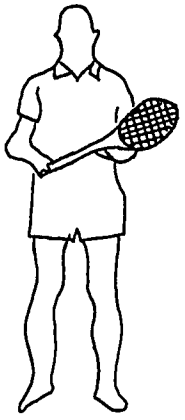
5. In the ready position a player should

   A. stand straight with the tennis racket held across the front of the body.

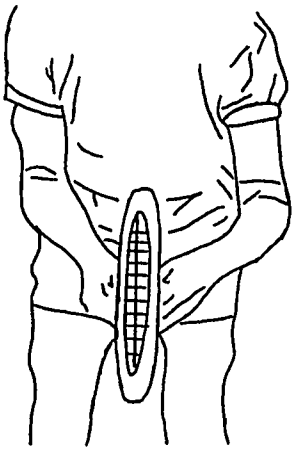
   B. hold the tennis racket so it is pointing toward the opponent's side of the tennis court.

   C. keep the legs and back straight with the tennis racket held low to one side.

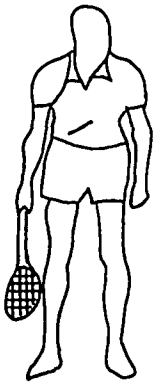
   D. stand with the legs and back slightly bent.



A



B



C

D

6. When taking the racket back for the forehand

   A. both hands control the racket.

   B. the upper arm remains close to the body.

   C. the racket extends well beyond a line parallel to the flight of the on-coming tennis ball.

   D. the head of the racket will always be above the wrist.

   E. the body will eventually be between the net and the arm holding the racket.

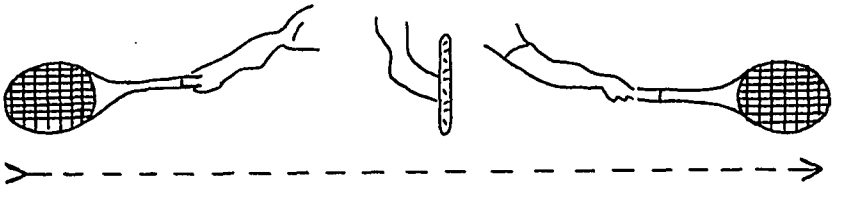
7. On the forward swing of the forehand a player should

   A. keep the swing level throughout the stroke.

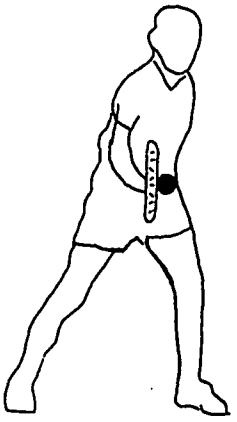
   B. strike the ball between the hips with a flat racket face.

   C. close the racket face as contact is made with the ball just forward of the front hip.

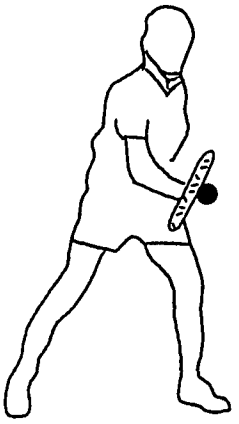
   D. shift most of the body weight backward while the arm is swinging forward.



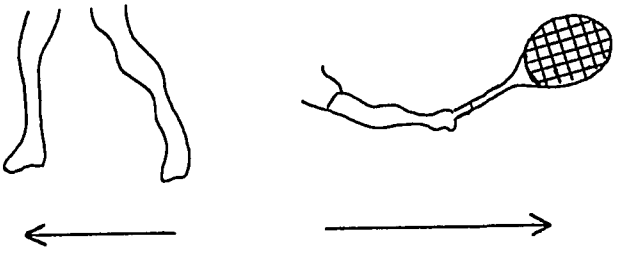
A



B



C



D

8. When taking the racket back for the backhand

   A. both hands control the racket.

   B. the upper arm remains close to the body.

   C. the racket extends well beyond a line parallel to the flight of the on-coming tennis ball.

   D. the head of the racket will always be above the wrist.

   E. the body will eventually be between the net and the arm holding the racket.

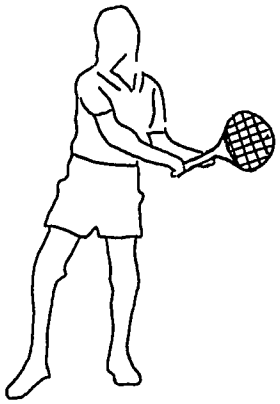
9. On the forward swing of the backhand

   A. the hand controlling the throat should push the racket forward as the swing begins.

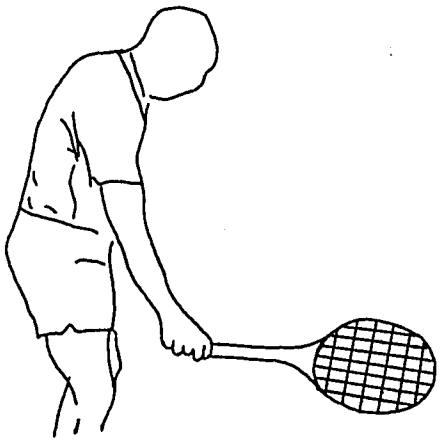
   B. keep your eyes on the racket face throughout the swing.

   C. swing slightly upward, toward the top of the fence beyond the net.

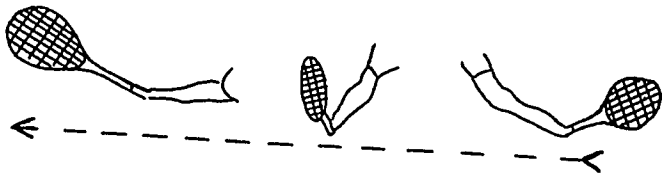
   D. look forward toward your opponent's court as you strike the ball flat.



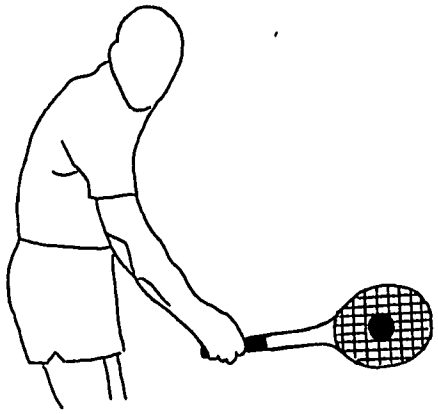
A



B



C



D

10. When ready to serve a player should

    A. use either the Eastern forehand grip or backhand grip when learning.

    B. Assume a grip somewhere between the Eastern aforehand grip and backhand grip as serving skill increases.

    C. stand with the body at a right angle to the net.

    D. grip the handle with one hand while holding tennis balls and the throat of the racket with the other hand.

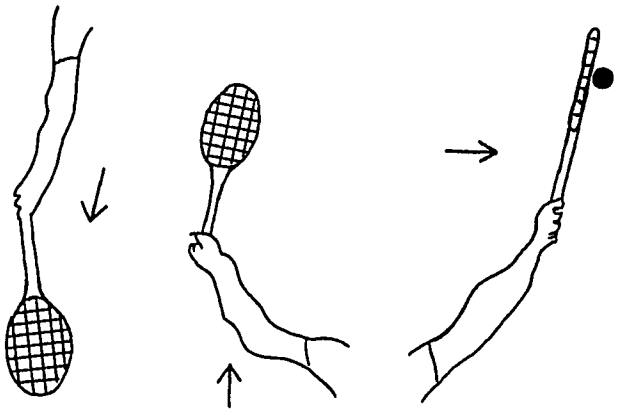
    E. position the feet shoulder width apart parallel to the baseline.

11. The sequence of the service swing is

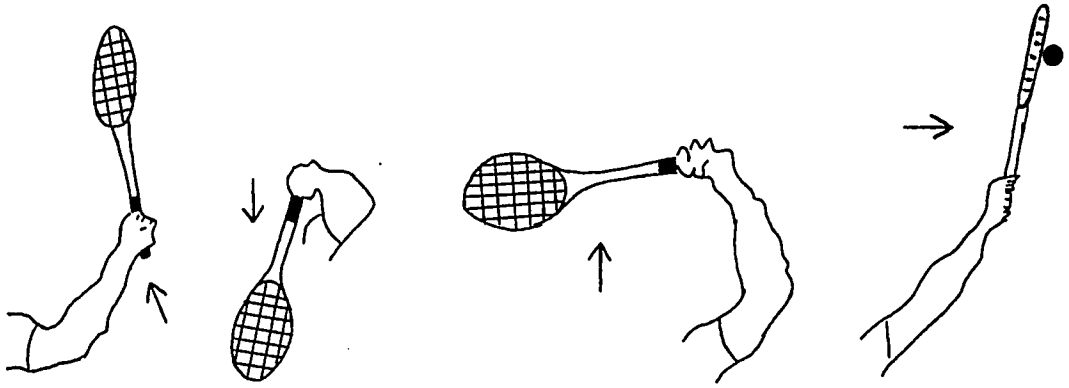
    A. down, up, then forward to strike the ball.

    B. up, down, up, then forward to strike the ball.

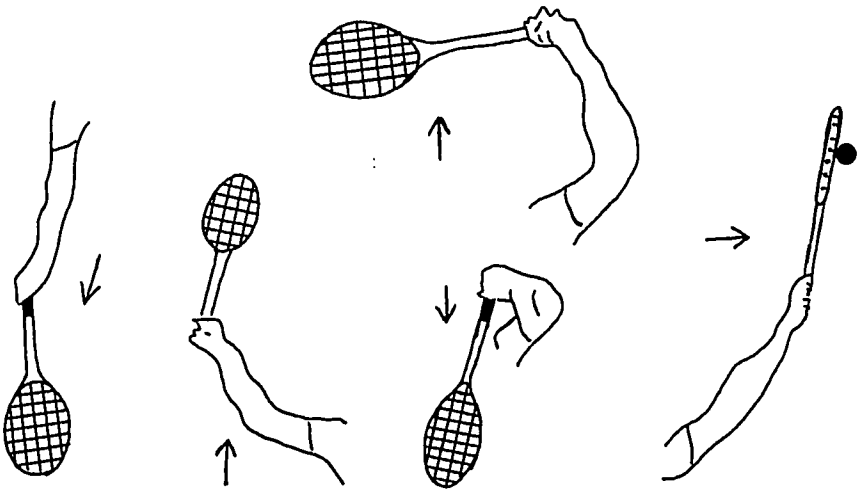
    C. down, up, down, up, then forward to strike the ball.



A



B



C

12. The follow-through of the racket should

A. finish at waist level for the forehand.

B. result in a return to the ready position regardless of the stroke being executed.

C. carry to a point shoulder high for both the forehand and backhand.

D. end below the knees on the service.

E. finish on the same side of the body for both the forehand and backhand.

KNOWLEDGE TEST OF BEGINNING TENNIS FUNDAMENTALS

Correct Answers:

1. A; F.
2. A; B; D.
3. D; E.
4. A; C; D; E.
5. B; D.
6. B; D; E.
7. None
8. A; B; D.
9. A; C.
10. B; D.
11. C.
12. B; C; D; E.

APPENDIX B

Knowledge Test Scores for Grades Seven, Eight, and Eleven

Method of Instruction		Cartoon Illustration	Traditional	Cartoon Illustration	Traditional	Cartoon Illustration	Traditional
		7	7	8	8	11	11
Subject	1	29	35	37	42	42	46
	2	36	40	37	35	43	42
	3	37	33	42	40	40	38
	4	40	33	31	39	39	41
	5	40	38	30	41	43	45
	6	41	39	36	33	39	40
	7	43	33	45	34	35	33
	8	39	27	38	47	38	34
	9	33	36	37	36	34	41
	10	26	33	35	30	35	39
	11	32	33	36	37	38	38
	12	33	32	43	37	32	46
	13	40	34	42	39	47	45
	14	49	42	45	36	41	33
	15	37	36	44	35	38	35
	16	37	35	42	39	36	38

APPENDIX C

Knowledge Test Scores of Four Coeducational College Classes

		Group 1 (cartoon illustration)				Group 2 (traditional)			
		Class 1		Class 2		Class 3		Class 4	
		Male	Female	Male	Female	Male	Female	Male	Female
Subject	1	47	38	35	41	41	40	38	45
	2	41	41	34	40	39	41	47	39
	3	46	40	43	36	48	45	36	42
	4	49	45	44	36	43	36	38	40
	5	47	39	40	40	44	43	46	41
	6	45	43	41	34		41	34	41
	7	46	44	46	38		39		44
	8		38		39		42		38
	9		40		37		46		31
	10		41		41		47		33
	11		41		42		44		40
	12		36		42		43		44
	13				37		31		41
	14						37		39
	15						36		38
	16								46
	17								44

APPENDIX D

A QUESTIONNAIRE FOR EVALUATION OF CARTOON ILLUSTRATION IN TEACHING TENNIS FUNDAMENTALS

BACKGROUND INFORMATION

Age_____Sex_____Highest Degree Held_____Years Teaching Experience_____Undergraduate Major_____

Undergraduate Minor_____Present Position

College_____Secondary School_____

Total Students Taught in this Study_____Males_____Females

INSTRUCTIONS

Please indicate in as fair and impartial a manner as possible your feelings toward The Beginner's Self Instruction Book of Tennis Fundamentals as an aid in your teaching of beginning tennis fundamentals.

The highest rating for any statement is 5, followed by ratings of 4, 3, 2, and 1. Put a check mark (✓) in the column that reflects most clearly your evaluation of each statement.

I. PREPARATION

A. Indicate your reactions concerning the use of the book in your preparation.

	A very great deal 5	A great deal 4	Somewhat 3	Very little 2	Not at all 1
1. The book aided in my organization of material for presentation.					
2. The book was used as the only source in preparing.					
3. The book was used as a supplement to the required text.					
4. I enjoyed preparing with the book.					
5. The book served as an aid in reviewing tennis fundamentals.					

II. PRESENTATION

A. During the unit on tennis instruction, The Beginner's Self Instruction Book of Tennis Fundamentals was presented:

	Always 5	Very frequently 4	Fairly often 3	Seldom 2	Never 1
6. During the introductory, non-practice phase of instruction in each fundamental.					
7. During practice and instruction of each fundamental.					
8. As a summary following practice and instruction in each fundamental.					
9. During the first part of the unit.					
10. During the middle part of the unit.					
11. During the last part of the unit.					
12. As a review on rainy days of the fundamentals already covered on the tennis courts.					
13. As an introduction on rainy days to new fundamentals not previously covered on the tennis courts.					

III. USE

A. Evaluate your teaching in conjunction with the use of the book.

	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly Disagree 1
14. The use of the book created additional rapport with the class.					
15. My organization of tennis knowledge was increased.					
16. There was less verbalization on my part.					
17. The book enabled me to move around and maintain more student contact.					

	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly Disagree 1
18. My necessity to demonstrate fundamentals was reduced.					
19. The book was of value early in the unit.					
20. The book was of value during the middle part of the unit.					
21. The book was of value toward the end of the unit.					
22. The common errors of beginning tennis players were more easily recognized.					
23. When correcting fundamentals referring to the book made correct execution more clear to the students.					

B. Evaluate your students' interest and learning of tennis fundamentals in conjunction with the use of the book.	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly Disagree 1
24. The students seemed motivated to learn tennis fundamentals.					
25. The students seemed to learn tennis fundamentals faster than previous groups taught.					
26. There was less time wasted in introducing and learning new skills.					
27. The students were able to better analyze and correct some of their own faults.					

IV. RELATIONSHIP OF CARTOON ILLUSTRATION AND THE WORD DESCRIPTIONS IN THE BOOK

A. Give your opinions as to how the cartoon illustrations and word descriptions relate.

	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly Disagree 1
28. The word descriptions and cartoon illustrations complement one another.					
29. The cartoon illustrations are sufficient by themselves.					
30. More detailed word descriptions of the cartoon illustrations is needed.					

INSTRUCTIONS

Place a check mark (✓) to the right of any statement which applies to you or reflects your evaluation of The Beginner's Self Instruction Book of Tennis Fundamentals. When called for, briefly state or rate your evaluation in the spaces provided.

V. EXPERIENCE

A. Indicate the extent of your experience in tennis.

1. Member of high school varsity team. ( )
2. Member of college varsity team. ( )
3. Received tennis course in high school. ( )
4. Received tennis course in college. ( )
5. Participated in high school intramural tennis. ( )
6. Participated in college intramural tennis. ( )
7. Have been taught private lessons by tennis professional. ( )
8. Engaged in country club or social tennis. ( )
9. Learned to teach tennis in college physical education methods course. ( )

10. Learned to teach tennis after undergraduate preparation. ( )

11. Most of my tennis is self taught. ( )

12. Have taught tennis in summer employment. ( )

13. Have attended tennis clinics. ( )

VI. CONTENT

A. Rate the content of the book in presenting tennis fundamentals.

1. Basic Essentials	Complete	Incomplete: should include:
a. The racket	( )	( )
b. Grips	( )	( )
c. Pivoting	( )	( )
d. Ready position	( )	( )
2. Forehand Stroke		
a. Backswing	( )	( )
b. Forward swing	( )	( )
c. Contact	( )	( )
d. Follow through	( )	( )
3. Backhand Stroke		
a. Backswing	( )	( )
b. Forward swing	( )	( )
c. Contact	( )	( )
d. Follow through	( )	( )
4. Service		
a. Stance	( )	( )
b. Toss	( )	( )
c. Swing	( )	( )
d. Contact	( )	( )
e. Follow through	( )	( )

VII. CONFUSING ELEMENTS

V. Indicate in the spaces provided to what extent any fundamentals appeared to you to be confusing. Leave the space blank if the fundamental was clearly presented.

1. Nomenclature of racket: _____
2. Grips: _____
3. Pivoting: _____
4. Ready position: _____
5. Forehand stroke: _____
6. Backhand stroke: _____
7. Service: _____

VIII. WORTHWHILENESS

A. Rate the overall value of The Beginner's Self Instruction Book of Tennis Fundamentals as a teaching aid.

1. Excellent ( )
2. Good ( )
3. Average ( )
4. Below average ( )
5. Poor ( )

B. Rank the sections of the book you liked best (1, 2, 3, and 4).

1. Basic Essentials ( )
2. Forehand Stroke ( )
3. Backhand Stroke ( )
4. Service ( )

C. Considering its use as a teaching aid, briefly state the chief value and/or major shortcoming of The Beginner's Self Instruction Book of Tennis Fundamentals. If you feel there is no chief value and/or major shortcoming, leave blank.

1. Chief value: _____

2. Major shortcoming: _____

IX. RECOMMENDATION

A. Insofar as recommending cartoon illustration for future use in teaching tennis fundamentals:

1. I would not recommend for any age level. ( )

2. I would recommend it for elementary level. ( )

3. I would recommend it for junior high level. ( )

4. I would recommend it for high school level. ( )

5. I would recommend it for college level. ( )

APPENDIX E

A QUESTIONNAIRE FOR EVALUATION OF CARTOON ILLUSTRATION IN LEARNING TENNIS FUNDAMENTALS

BACKGROUND INFORMATION

Age_____Sex_____Grade Level_____School_____

INSTRUCTIONS

Please indicate in as fair and impartial a manner as possible your feelings toward The Beginner's Self Instruction Book of Tennis Fundamentals as an aid in your learning of beginning tennis fundamentals.

The highest rating for any statement is 5, followed by ratings of 4, 3, 2, and 1. Put a check mark (✓) in the column that reflects most clearly your reaction to each statement.

I. USE

A. Please respond to the following statements with regard to the extent to which you used the book.

	A very great deal 5	A great deal 4	Somewhat 3	Very little 2	Not at all 1
1. We used the book while being taught tennis fundamentals on the courts.					
2. We used the book on rainy days.					
3. The cartoon illustrations clarified the manner in which the tennis fundamentals were to be done.					
4. I used the book when my teacher was instructing on other courts.					
5. The book stimulated discussion with fellow students.					
6. I referred to the book for the purpose of correcting errors in execution of tennis fundamentals.					

	A very great deal 5	A great deal 4	Somewhat 3	Very little 2	Not at all 1
7. I can recall the proper execution of tennis fundamentals as they were cartooned more so than the way they were explained or demonstrated.					
8. We used the "testing your knowledge" sections at the end of the chapters.					

II. RELATIONSHIP OF CARTOON ILLUSTRATION AND THE WORD DESCRIPTIONS IN THE BOOK

A. Give your opinions as to how the cartoon illustrations and word descriptions relate.

	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly Disagree 1
9. The word descriptions make the cartoon illustrations more clear.					
10. The cartoon illustrations are sufficient by themselves.					
11. More detailed word descriptions of the cartoon illustrations is needed.					

INSTRUCTIONS

Please answer the following by placing a check mark (✓) to indicate your response to the question concerning the use of The Beginner's Self Instruction Book of Tennis Fundamentals. When called for, rank your answers in the spaces provided.

III. PRESENTATION AND DEMONSTRATION

A. Check below if you felt at times that any of the material presented in the book was different from what your teacher said or demonstrated.

1. Basic Essentials
   a. The racket ( )
   b. Grips ( )
   c. Pivoting ( )
   d. Ready position ( )
2. Forehand Stroke
   a. Backswing ( )
   b. Forward swing ( )
   c. Contact ( )
   d. Follow through ( )
3. Backhand Stroke
   a. Backswing ( )
   b. Forward swing ( )
   c. Contact ( )
   d. Follow through ( )
4. Service
   a. Stance ( )
   b. Toss ( )
   c. Swing ( )
   d. Contact ( )
   e. Follow through ( )

B. Check below if any tennis fundamentals cartoon illustrated in the booklet were not demonstrated by your teacher.

1. Basic Essentials
   a. The racket ( )
   b. Grips ( )
   c. Pivoting ( )
   d. Ready position ( )

2. Forehand Stroke

   a. Backswing ( )

   b. Forward swing ( )

   c. Contact ( )

   d. Follow through ( )

3. Backhand Stroke

   a. Backswing ( )

   b. Forward swing ( )

   c. Contact ( )

   d. Follow through ( )

4. Service

   a. Stance ( )

   b. Toss ( )

   c. Swing ( )

   d. Contact ( )

   e. Follow through ( )

IV. WORTHWHILENESS

A. Rank the chapters of the book as to the extent of interest you had for each. In the spaces provided mark (1) for the chapter most interesting, followed by (2), (3), and (4).

1. Basic Essentials (racket, grips, pivoting, ready position) ( )

2. Forehand Stroke ( )

3. Backhand Stroke ( )

4. Service ( )

B. Rank the ways you feel you learned best in each of the sections below. In the spaces provided mark (1) for

the way you learned most effectively, followed by (2), (3), and (4).

1. Basic Essentials (racket, grips, pivoting, ready position)

   a. Teacher demonstration ( )

   b. Cartoon illustration ( )

   c. Other students ( )

   d. Combination of teacher demonstration and cartoon illustration ( )

2. Forehand Stroke

   a. Teacher demonstration ( )

   b. Cartoon illustration ( )

   c. Other students ( )

   d. Combination of teacher demonstration and cartoon illustration ( )

3. Backhand Stroke

   a. Teacher demonstration ( )

   b. Cartoon illustration ( )

   c. Other students ( )

   d. Combination of teacher demonstration and cartoon illustration ( )

4. Service

   a. Teacher demonstration ( )

   b. Cartoon illustration ( )

   c. Other Students ( )

   d. Combination of teacher demonstration and cartoon illustration ( )

C. Check below your feelings concerning the questions at the end of each chapter in the book.

1. They provided a good review of the fundamentals presented. ( )

2. They should include other types of questions. ( )

3. They were too simple. ( )

4. They made no contribution to learning the fundamentals. ( )

APPENDIX F

Mean Scores for Ratings on 26 Teacher and 691 Student Questionnaires

	Teacher	Student
Statement 1.	3.53	3.26
2.	2.50	2.89
3.	3.00	4.00
4.	3.84	2.06
5.	4.03	2.48
6.	3.92	3.02
7.	3.46	3.42
8.	3.23	3.13
9.	3.69	4.13
10.	3.00	2.61
11.	2.76	2.81
12.	3.03	
13.	2.61	
14.	3.57	
15.	3.53	
16.	3.19	
17.	3.30	
18.	3.07	
19.	4.19	
20.	3.50	
21.	3.30	

		Teacher	Student
Statement	22.	3.53	
	23.	3.84	
	24.	3.88	
	25.	3.30	
	26.	3.42	
	27.	3.92	
	28.	4.30	
	29.	2.00	
	30.	2.50	

VITA

The writer was born in Bardstown, Kentucky on June 24, 1935. He received his elementary and secondary education at the same location.

In 1958, Western Kentucky University awarded the writer the Bachelor of Science degree with a major in physical education and minors in biology and English. He received his Master of Arts degree in physical education and health from the University of Kentucky in 1959.

The writer served as head tennis coach and assistant in basketball at the University of Kentucky during the years 1959-1963. During the school year 1963-1964 the writer taught physical education and coached tennis and basketball at Newman High School, Wausau, Wisconsin. During the academic years 1964-1967 the writer taught physical education and coached tennis on the faculty of Western Kentucky University, Bowling Green, Kentucky. The writer taught physical education and served as head tennis coach and assistant basketball coach at Jefferson State Junior College, Birmingham, Alabama, during the school year 1967-1968. The writer was a full-time graduate student and teaching assistant at Louisiana State University from 1968-1970.

In May, 1970, he accepted the position as Departmental Chairman of Health, Physical Education, and Recreation

at Jefferson State Junior College, Birmingham, Alabama. The Doctor of Education degree, with a major in physical education and a minor in education administration, was awarded by Louisiana State University in August, 1970.

EXAMINATION AND THESIS REPORT

Candidate: Ballard J. Moore

Major Field: Physical Education

Title of Thesis: Evaluation of a Pictorial Form of Instructional Aid in the Teaching of a Motor Skill

Approved:

Jack K Nelson
Major Professor and Chairman

Mary Goodrich
Dean of the Graduate School

EXAMINING COMMITTEE:

J. A. Drury

Ralph E. Stelen

Evelyn G. Clark

Sam Adams

Date of Examination:

July 20, 1970